MONTHLY WEATHER REVIEW.

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VOL. XXXIII. FEBRUARY, 1905. No. 2

INTRODUCTION.

The MONTHLY WEATHER REVIEW for February, 1905, is based on data from about 3583 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 176; West Indian Service, cable and mail, 4; River and Flood Service, regular 52, special river and rainfall, 363, special rainfall only, 98; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 3258; Canadian Meteorological Service, by telegraph and mail, 33; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 1; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; and Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that at regular Weather Bureau stations all data intended for the Central Office at Washington are recorded on seventy-fifth meridian or eastern standard time, except that hourly records of wind velocity and direction, temperature, and sunshine are entered on local standard time. As far as practicable, only the seventy-fifth meridian standard of time, which is exactly five hours behind Greenwich time, is used in the text of the REVIEW. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Over the British Isles the pressure was generally low from the 1st to the 3d, on the 9th, and from the 17th until the close of the month, and relatively high from the 4th to 8th, and 10th to 16th. The most important storm over the eastern Atlantic occurred on the 26th, 27th, and 28th, when gales with barometer readings below 29.00 inches were reported from several coast stations in Ireland and Scotland. Over southwestern Europe and the Azores high pressure prevailed throughout the month. In the higher latitudes of the western North Atlantic pressures were generally low, except from the 4th to 6th, and 19th to 22d. Between Bermuda and the south Atlantic coast pressures were relatively high, except on the 10th and from the 23d to 28th.

The storms that visited the Atlantic coast of the United States during the month were not remarkable, although one that traversed northern New England on the 13th, and another that moved from the North Carolina coast to Nova Scotia from the 25th to 27th caused winds of considerable strength. Ample warning of these storms was given.

A number of storm centers, attended by snow and high winds on the Great Lakes, passed through Canada near the boundary of the United States. A barometric depression of considerable energy, whose center passed between Hudson Bay and the lower Lakes during the 17th and 18th, caused high winds and heavy snow in the lower Lake region. Many railroads in that section were taxed to the utmost to clear away the drifts, and traffic was greatly delayed.

The Gulf and north Pacific coasts were unusully free from storms. On the evening of the 1st a storm center appeared off Eureka, Cal., moved inland, and for nearly a week pursued a very erratic course through Nevada, southern California, Arizona, and Utah until on the 7th it passed into Colorado, and thence eastward (Chart II, Ia). This storm was accompanied by heavy rains in the Southwest, a remarkable phenomenon for the season in that usually dry region.

The precipitation of the month was above normal in the southwest and southeast, and below normal in the northeastern, northwestern and central portions of the country.

From the Rocky Mountains to the Atlantic coast the month showed remarkable and at some points unprecedented departures from normal temperatures, and at points in the Mississippi and Ohio valleys and the Southwest the departures below the monthly averages exceeded 12°. The average temperature for the three winter months at Washington, D. C., was 29°, the lowest on record since 1855–56, the next lowest, 29.4°, being the mean of 1903–4. The harbors of the North Atlantic States were in many cases blockaded by ice, and where actual blockades did not exist floating ice caused considerable trouble. The first half of February was continuously cold, and several well-defined cold waves swept over the country. The most severe cold was generally experienced from the 11th to the 14th. The following are among the minimum temperatures that attended the cold wave of the dates named: St. Paul, Minn., —26°; Chicago, Ill., —18°; Kansas City, Mo., —22°; Pueblo, Colo., —26°; Santa Fe, N. Mex., —4°; Roswell, N. Mex., —26°; Dodge, Kans., —20°; Amarillo, Tex., —8°; Palestine, Tex., 6°; New Orleans, La., 18°; Memphis, Tenn., zero; St. Louis, Mo., —18°; Pittsburg, Pa., —6°; Albany, N. Y.,

—8°; Washington, D. C., 4°; Charleston, S. C., 20°; Atlanta, Ga., 2°; Jacksonville, Fla., 26°. In connection with this and other cold waves of the month, warnings issued by the Weather Bureau permitted protective measures whereby considerable loss to fruits and tender vegetation in the Gulf States and Florida was avoided. The prevailing type of weather conditions changed materially about the middle of the month, and frequent alternations of cold to warm and vice versa were the rule in northern districts. In northeastern districts cold weather continued with few interruptions until the end of the month. On the Pacific coast temperatures were generally above the normal throughout the month.

NEW ENGLAND FORECAST DISTRICT.

The month was marked by continuously low temperature, the daily means ranging from 3° to 6° below the normal, and by deficient precipitation, the amounts ranging from 25 to 50 per cent below the normal. The storm of the 12-13th was the most severe of the month, high easterly winds and gales prevailing along the New England coast. The other disturbances were mostly accompanied by offshore or westerly winds. Warnings were issued in advance of all storms. While shipping suffered little delay from storms, it was at a standstill from ice blockades during several days of the first decade in many of the New England harbors. According to newspaper accounts, not for nearly sixty years have such conditions obtained. During the first week of the month Buzzards Bay was frozen over from side to side and almost the entire distance from New Bedford to Elizabeth Islands. The upper part of the bay was closed to navigation, the lamps at three light-houses were extinguished, and ice boats sailed over the harbor. At Nantucket the ice embargo was the worst since 1857. Navigation in Boston Harbor was much impeded by floating ice, though immense floes such as blockaded other harbors did not appear here.—*J. W. Smith, District Forecaster.*

CENTRAL FORECAST DISTRICT.

The most noteworthy features of the month were the remarkably severe weather—rain, snow, sleet, and intense cold—during the first half, and the mild, dry weather prevailing during the latter half of the month. There were two periods of severe conditions due to snow, sleet, or rain, followed by very low temperatures, the first running from the 3d to the 8th, and the second from the 12th to the 13th of the month. During these periods railroad and telegraphic facilities were badly hampered. The first week of the month was very cold, but the severest cold wave occurred from the 13th to the 16th, when temperatures of zero and below were registered throughout the district. Cold-wave warnings were issued February 1, 10, 11, and 12, all of which were fully justified.—*F. J. Walz, District Forecaster.*

NORTH-CENTRAL FORECAST DISTRICT.

The weather was extremely cold during the first half of the month, the first sixteen days being the coldest period of that length in February in the history of the Weather Bureau at many stations in this district. There was a gradual breaking up of the cold by the middle of the month, and during the last twelve days mild conditions prevailed. There was no general cold-wave warning issued, as the weather was cold at the opening of the month, and there was no material change until the general breaking up. There were no exceptionally heavy snowstorms, although the total amount for the several storms was considerable. Traffic on steam railways was delayed during the severe weather because the intense cold rendered difficult the generation of steam in boilers. The forecasts were closely watched by the railroad managers and by shippers of perishable goods, who were informed in advance of the approach of moderate temperatures so that they might hurry forward delayed orders. The winter navigation was continued by several lines, but was often much delayed by ice fields. Advisory messages were sent in advance of the storms to the open ports of Lake Michigan on several occasions, and no casualties were reported.—*H. J. Cox, Professor and District Forecaster.*

WEST GULF FORECAST DISTRICT.

High northerly winds, for which warnings were issued, occurred along the Gulf coast on the 12th. Unseasonably low temperatures were experienced, especially from the 11th to the 14th, when this section was visited by the severest cold wave since 1899. The temperature fell to zero over the northern portion of the district and to 18°, or below, along the Gulf coast. Warnings were issued advising the public to prepare for low temperature whenever such was likely to injure vegetation, and, notwithstanding the low temperatures recorded, a large amount of tender vegetation was protected and carried through in good condition. Indications are that vegetable crops properly protected will come in nearly as early as usual. The press comments on the work of the Weather Bureau in issuing warnings were very favorable.—*I. M. Cline, District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

During the first twelve days of the month precipitation was almost continuous in the lower half of the Plateau region, and for a part of the time on the eastern slope. The snowfall was very heavy in parts of the Mountain region, while the rainfall was the greatest on record for February in southeastern Arizona, and exceeded the normal annual amount along the western border of the Territory. The precipitation during this period was accurately forecast. The stormy conditions attended a low area whose center was constantly shifting from one part to another of the middle Plateau and southern California, finally effecting a passage across the Continental Divide on the 8th. As regards temperature, the low area whose development began in the Southwest on the 9th proved the most important of the winter. For the cold wave that followed, warnings were sent on the 11th to Utah, western Colorado, western New Mexico, and the following morning to northern Arizona, and continued for parts of New Mexico. The cold was severe; at Lay, in northwestern Colorado on the morning of the 12th, the temperature reached —47°, the lowest on record in the State. Frost, notice of which had been sent out twenty-four hours in advance, was reported in south-central Arizona on the mornings of the 12th and 13th. The latter half of the month was generally mild, with precipitation in New Mexico and Arizona.—*F. H. Brandenburg, District Forecaster.*

NORTH PACIFIC FORECAST DISTRICT.

There were no storms of consequence in the North Pacific States up to the 18th, when a short period of stormy weather set in and extended to the 23d. The remainder of the month was mild, pleasant, and free from storms. The precipitation was deficient in all sections, and at the close of the month the amount of snow in the mountains was much less than is usual at the close of February. Cold-wave warnings were issued to all stations east of the Cascade Mountains on the morning of the 10th, announcing the approach of a cold wave which reached its maximum severity on the morning of the 12th, with temperatures considerably below zero in eastern Oregon, eastern Washington, and Idaho. In the western portions of the district the temperatures fell to between 15° and 17° above zero.—*A. B. Wollaber, Acting District Forecaster.*

SOUTH PACIFIC FORECAST DISTRICT.

The month was an unusually pleasant one and singularly free from the gales and southeast storms which are customary at this time of the year. The month was, however, abnormal in the matter of rainfall in the Valley of the Colorado. In southeastern California, Arizona, southern Idaho, and southern Nevada, or what may be called the arid region, the rainfall for February varied from four to seven inches, which was more than twice the amount for the same time in northern California, Oregon, and Washington. It will also be noted that during

cold-wave periods east of the Rocky Mountains, areas of low pressure seem to develop over the Southwest. The month began with general rains. On the 3d thunderstorms were reported in southern California, with high southerly winds, and this showery condition continued until the 6th. On the 10th cold-wave warnings were issued for Winnemucca, Carson City, and Red Bluff, and on the 11th for Independence. Frost warnings were issued on the 11th for the morning of the 13th, thus giving forty-eight hours warning. Thin ice was noted at San Francisco on the morning of the 12th and heavy to killing frosts occurred generally in the State on the 13th. If any damage resulted it was not due to lack of warning.—*A. G. McAdie, Professor and District Forecaster.*

RIVERS AND FLOODS.

At the end of January, owing to the great depth of the snow over the greater portion of the country and the enormous quantities of ice in the rivers, there were well-founded fears of danger and disaster from flood, should there come a sudden thaw accompanied by warm and heavy rains. The snow line extended into the northern portions of the Gulf States, and over the principal river valleys the snow ranged from six to twenty inches in depth. At the same time there were eleven inches of ice as far south as Cairo and rather more in New York and Pennsylvania. Very fortunately, however, low temperatures prevailed almost continuously and evaporation and slow melting under the sun's rays by day steadily but slowly decreased the mass of snow and ice, any unusual decrease being prevented by the nightly freezing. Not much was lost during the first half of the month, but during the second half the sun's influence was more pronounced and at the end of the month the snow line had receded to the district extending from the upper Mississippi Valley eastward. There had also been some decrease in the thickness of the ice, although dangerous gorges persisted in the Ohio, Mississippi, and the rivers of the Middle Atlantic States. As compared with the corresponding date of 1904 there was less snow and ice in the upper Mississippi and Missouri rivers, but rather more in the East. The ice gorges in the Ohio, while not so extensive as those of the preceding year, were, nevertheless, of considerable magnitude and a source of much apprehension, it being apparent that they could not go out without causing considerable damage. At Cincinnati a gorge was formed on the 2d, and on the 4th people were crossing on the ice. On the 11th warning was issued that the ice would shortly move, and on the next day it started down, causing some damage to boats, etc., but soon stopped a short distance below. On the 13th the river had closed again and there were great gorges at Medoc Bar and North Bend. On the 24th the gorge at Maysville broke, and on the 28th the ice again started at Cincinnati but soon stopped, causing a sudden fall of about ten feet in the water, and leaving a number of steamboats and other craft stranded.

At Louisville the gorge moved at times, but navigation was seriously impeded throughout the month.

At Cairo navigation southward was resumed on the 15th, and the ice gorge in the Mississippi began to move out on the 28th.

In the Mississippi, at St. Louis, there were from one to thirteen feet of ice on the 13th, and dynamite was used to keep an open channel, but with partial success only; on the 26th the ice began to move and warnings were issued that a general breaking up was probable within a very short time. The break took place on the following day, with some minor disasters to river craft. On the 28th the last of the ice passed out and the ferry boats resumed their trips.

At Memphis navigation was resumed on the 10th, ceased on the 13th, and was again resumed on the 17th. The ice disappeared on the 20th.

At Chattanooga, on the Tennessee River, navigation was resumed on the 2d, and at Nashville, on the Cumberland, on the 6th.

At Riverton, Va., on the Shenandoah, the ice was seventeen inches in thickness on the 18th, the ice field extending for a distance of ten miles both north and south. Some gorges in the Potomac were also threatening, but no damage had been done at the close of the month.

There were two moderate freshets in the Tennessee. Both were well forecast, and neither caused any damage. At Florence, Ala., 70,000 cross-ties were taken out on the rises.

Heavy rains on the 12th and 13th, and again on the 20th and 21st, over the Pedee and Wateree watersheds, caused rapid rises to stages from one to seven feet above the danger lines. Warnings that were issued on the 13th and 21st were the means of saving a large amount of property. A number of roads and bridges were destroyed, and some cattle pasturing in the swamps were drowned, the water reaching them before they could be collected.

Danger-line stages were also reached in the eastern North Carolina rivers on the 22d and 23d, for which warnings were issued on the 20th and 21st.

The heavy rains of the 12th and 13th caused freshets in the lower portions of the Oconee and Ocmulgee rivers, and danger-line stages were general below Dublin and Macon, Ga. At Abbeville, Ga., the Ocmulgee River was above the danger line of eleven feet from the 14th until the 25th, inclusive, with a crest stage of 15.8 feet on the 18th and 19th. Warnings were issued on the 12th; they were very timely and accurate, and were of the greatest benefit to all interests concerned. Reports received show that property to the amount of at least $200,000 was saved by the warnings. In the Apalachicola system the stages were also from two to nine feet above the danger lines.

The rains from the 7th to the 10th, inclusive, necessitated several warnings for the Coosa and Alabama rivers; the stages reached were within a fraction of a foot of those forecast, and property of the value of $75,000 was saved. The stages of the Alabama River were from three to four feet above the danger lines.

About the same time warnings of a similar character were issued for the Black Warrior and lower Tombigbee rivers, and were well verified. At Demopolis, Ala., a stage of 55.4 feet, 20.4 feet above the danger line, was reached on the 18th, and the stage remained above 50 feet from the 13th to the 27th, inclusive. The first warnings were issued on the 10th from the new district center at Meridian, Miss., for the Chickasawhay, Leaf, and Pascagoula rivers, and additional ones on the 12th. The flood stages reached ranged from three feet above the danger line on the Pascagoula to fifteen feet on the upper Chickasawhay.

The highest and lowest water, mean stage, and monthly range at 275 river stations are given in Table VI. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Divison.

The following summaries relating to the general weather and crop conditions during February are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon reports from cooperative observers and crop correspondents, of whom there are about 3300 and 14,000, respectively:

Alabama.—First two decades wet, quite cold and unfavorable; considerable snow and sleet over northern and western counties; cold wave of 13th to 17th broke previous low temperature records in northern counties; considerable wheat and oats winter-killed. Last week dry and comparatively warm. Farm work behind, but being resumed at close of month, when some gardens were planted; little spring oats sown; fruit trees mostly dormant and apparently uninjured by extreme cold.—*F. P. Chaffee.*

Arizona.—A month of cloudiness; frequent and phenomenally heavy precipitation—the most general over the Territory since organization of Climate and Crop Service—some stations recording 10 to 13 inches in southern, and 20 to 40 inches of snowfall in northern, sections; resultant floods damaging railroads, bridges, and canal dams and retarding mining operations. Rapid growth in wheat and barley, which were beginning to head. Crops two to four weeks advanced in southern, one to two weeks behind in northern section, owning to late snow. Stock and ranges in splendid condition. Water supply abundant. Agricultural prospects most promising.—*L. N. Jesunofsky.*

Arkansas.—The first three weeks of the month were extremely cold, with much more than the usual amount of snow and ice on the gound; the last week the temperature was seasonable, with little or no precipitation. Fall grains were injured somewhat by severe weather. No plowing was done. Unsheltered stock suffered considerably and some losses were sustained. Peach buds were injured generally in the northwest portion of the State; other fruit trees were not injured materially.—*Edward B. Richards.*

California.—Both temperature and rainfall were above normal. The most severe frosts of the season occurred on the 12th and 13th, but caused no material damage to early deciduous fruits or oranges. Heavy rains slightly damaged crops in some sections, but were of inestimable value in the San Joaquin Valley and southern California, where the water supply was better than for several years. All crops were in splendid condition—*Alexander J. McAdie.*

Colorado.—Over the eastern half of the State grazing was temporarily interrupted on account of the depth of snow. The condition of live stock varied from good in north-central portion to fair in eastern and southern parts of the State; winter feeding was carried on to some extent; in the western half of the State grazing was prevented on account of snow; live stock suffered from cold spells, but with no very serious results, as a rule; winter feeding was general.—*F. H. Brandenburg.*

Florida.—The month was drier and colder than the average; work progressed very well, although somewhat delayed by cold weather during the first half of the month. The absence of sufficient rain over central and southern districts was unfavorable for vegetables and citrus trees. Fall planted oats advanced, and a goodly acreage in central and southern districts was planted to corn. The severe cold wave on the 14th and 15th in west portion of the State was not seriously felt over eastern Florida.—*A. J. Mitchell.*

Georgia.—The month was cold and wet with severe freezes; from the 4th to the 8th occurred a severe storm of sleet, snow, and frozen rain which collected in large amounts on trees and caused much damage by breaking of branches over northern half of the State. Grains were seriously damaged, late sown oats having been killed in most sections. Many peach buds killed, especially Elbertas, in northern and middle sections, but enough uninjured buds remained for good yield; little damage in southern portion and fruit outlook excellent. Land was in fine condition. No farm work done.—*J. B. Marbury.*

Idaho.—Low temperatures prevailed early in the month; a severe cold wave was experienced in northern counties on the 11th, extending to other portions of the State by the 12th; zero temperatures were recorded at nearly all stations. The latter part of the month was exceptionally warm and bright. Snowfall in the mountains was unusually light and shortage of water was feared. Winter wheat, hay crops, and fruit were not seriously harmed by the cold wave; buds were swelling. Stock was thriving.—*Edward L. Wells.*

Illinois.—At the end of the month a considerable portion of wheat was covered with snow, ice, or water, and the condition of the plant was more or less conjectural. In some localities where it was uncovered the plant looked well, but many opinions were advanced that injury would be shown when a general thaw ensued. Fruit suffered from cold, especially peaches. Unfavorable reports were received from all sections. Most correspondents stated that peach buds had been killed, and others that they had probably been seriously damaged.—*Wm. G. Burns.*

Indiana.—Abnormally low temperatures prevailed until the 18th, three cold waves—two of them of marked severity—having passed over the State. Grave apprehension was felt regarding the effect of the intensely cold weather upon wheat, but as the ground was covered with snow or ice its condition could only be conjectured at any time during the month, except that during the last week the snow was rapidly disappearing in the south section and where uncovered fall sown crops seemed not to have suffered materially.—*W. T. Blythe.*

Iowa.—First half of February was one of the coldest midwinter periods on record. Latter half much warmer. More than usual snowfall, but much drifted, rendering farm work and care of stock quite difficult. At close of month ground was generally bare, with but little frost remaining in soil. Winter grain and grass were not materially injured; fruit buds apparently safe.—*John R. Sage.*

Kansas.—The ground was well covered with snow over the greater portion of the State until the 20th. The snow had all melted before the close of the month. Wheat was much improved by the snow and was generally in good condition. Only a few reports on peaches were received and they indicated that buds were killed. But small loss of stock reported. Ground in fine condition.—*T. B. Jennings.*

Kentucky.—Wheat, rye, and grasses reported to have stood cold weather very well, most fields having been protected by snow. Preparations for spring planting progressed. Stock suffered considerably from severe and protracted cold, but recuperated at the end of the month, on account of favorable weather. Fruit probably uninjured. Considerable tobacco still unmarketed at end of the month.—*F. J. Walz.*

Louisiana.—Cold, wet, weather during first and second decades proved very unfavorable for agricultural operations, as nothing could be done in the way of preparing the ground for the cotton and corn crops. The month closed more favorable, and plowing was pushed forward as rapidly as possible. Cane planting progressed slowly. The coldest weather since 1899 prevailed during the second decade with minimum temperatures about zero over northern portion of State and between 12° and 20° over southern portion on morning of 14th. Hardy vegetation suffered material damage and tender vegetation, where not protected, was killed. Much vegetation was protected and carried through the cold in good condition on advice of the Weather Bureau warnings.—*I. M. Cline.*

Maryland and Delaware.—February was 8° below normal at Baltimore; since 1871 only 1895 was colder. Precipitation was one inch below, and snowfall was normal. Ground was covered with snow the entire month, permitting only routine farm work. Wheat was supposed to be doing well, though some complaint of killed blades came from northeastern portions. Occasional slight damage to fruit trees was reported and some peach buds were killed. Stock was kept in good condition by liberal feeding.—*Oliver L. Fasvig.*

Michigan.—Winter wheat and rye were generally well protected by snow throughout the month. A few correspondents who carefully investigated wheat, by digging through the snow, reported a good winter growth. Fruit buds at the close of the month appeared to have wintered well.—*C. F. Schneider.*

Minnesota.—Cold weather till the 16th, with minimum temperatures considerably below zero almost daily; on several days early in the month, maximum temperatures were below zero also. Late in the month the temperatures were moderate. Precipitation was all snow. The snow lying on the ground was from three to fifteen inches deep in early and middle parts of month, but it was nearly all gone before the month closed. No work in soil possible.—*T. S. Outram.*

Mississippi.—Unusually cold and cloudy weather prevailed during the first three weeks, with heavy snows north and excessive rains east and south. Streams in the southeastern portion of the State overflowed their banks and detroyed or damaged a number of large bridges and drowned some stock. Sleet storms over the southwestern counties were very destructive to telephone lines and forest and fruit trees; many wagon roads were also blocked by fallen trees. Practically no farm work was done, except a little fencing. Oats were badly damaged. Conditions were more favorable the last week, but the ground was generally too wet to plow.—*W. S. Belden.*

Missouri.—First and second decades of the month notable for extremely low temperatures and heavy snowfall; ground well covered until the 23d, when thaw set in. Last week was mild and spring-like. Wheat in fair condition. It was estimated that about 90 per cent of peach buds were killed by low temperature of 13th. No farm work done.—*George Reeder.*

Montana.—The month was more than usually favorable for stock interests. Cattle and sheep on the ranges suffered during the coldest days, but losses were light. The range was clear and feed plentiful in the eastern counties; hay was fed generally in western counties. Wheat suffered somewhat from lack of snow protection. Considerable plowing was done in southern and western counties during warm days of the last decade.—*R. F. Young.*

Nebraska.—The ground was well covered with snow during the first three weeks, furnishing an excellent protection and preventing injury to winter wheat by the severe cold. The snow melted the last week of the

SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, FEBRUARY, 1905.

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.							Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.					Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	39.2	−8.0	Lucy	77	25	Valley Head	−18	14	7.24	+1.38	Spring Hill	12.64	Notasulga	3.48
Arizona	48.9	+0.3	Aztec, Picacho	85	26	Flagstaff	−18	13	4.61	+3.57	Pinal Ranch	13.38	Tuba	1.21
			Gilabend	85	28									
Arkansas	32.3	−9.4	Texarkana	82	28	Pond	−29	13	2.55	−1.01	Elon	5.71	2 stations	1.00
California	50.8	+2.1	Modesto	84	26	Bodie	−27	12	4.24	+0.85	Cuyamaca	15.91	Montague	0.33
			Shasta	84	25									
Colorado	22.9	−4.4	Trinidad	83	23	Lay	−47	12	1.04	−0.01	Durango	4.38	San Luis	0.04
Florida	58.1	−0.9	Hypoluxo	89	13	Milton	10	14	3.45	−1.24	De Funiak Springs	10.32	Marco	0.00
			Plant City	89	12									
Georgia	40.6	−6.2	Fleming	81	20	Tallapoosa	−8	14	7.16	+1.94	Putnam	13.44	Atlanta	3.12
			Waverly	81	12, 20									
Idaho	25.9	.....	Blue Lakes	70	28	Chesterfield	−48	12	0.65	.....	Priest River	2.05	2 stations	0.00
Illinois	19.0	−7.0	Plum Hill	68	28	Ashton	−32	13	1.64	−0.70	Morrison	2.89	Hillsboro	0.86
Indiana	20.9	−7.7	Evansville	59	28	Delphi	−24	13	2.07	−0.87	Marengo	4.18	Auburn	0.96
Iowa	12.8	−6.8	Glenwood, Onawa	69	28	Galva, Ida Grove	−41	2	1.57	+0.53	Belle Plaine	2.97	Sioux City	0.44
Kansas	21.1	−8.8	Garden City	86	25	Lebannon	−40	13	0.98	−0.12	Toronto	2.42	Jetmore	0.10
Kentucky	27.9	−6.7	Bowling Green	67	28	Edmonton	−16	14	2.44	−1.42	Alpha	4.35	Eubank	1.57
Louisiana	43.4	−9.0	Monroe	81	27	Minden	1	14	7.64	+3.00	Clinton	13.44	Mansfield	2.70
Maryland and Delaware	25.4	−6.2	4 Stations	53	25	Oakland, Md.	−20	4	2.69	−0.97	Millsboro, Del.	5.44	Westernport, Md.	0.43
Michigan	13.8	−5.6	Iron River	53	20	Ewen	−40	5	1.41	−0.56	West Branch	3.50	Humboldt	0.20
Minnesota	8.9	−1.9	Bird Island	65	27	Pokegama Falls	−51	2	0.55	−0.18	Rolling Green	2.40	Beaulieu	0.06
Mississippi	38.5	−8.9	Crystal Springs	79	23	University	−10	14	7.50	+1.94	Magnolia	12.82	Holly Springs	2.58
			Natchez	79	28									
Missouri	21.5	−8.6	Jackson	69	28	Warsaw	−40	13	1.64	−0.54	Princeton	3.10	Lamonte	0.47
Montana	16.9	−3.3	Billings	68	22, 25, 28	Grayling	−66	12	0.40	−0.36	Saltese	1.70	2 stations	0.00
			Toston	68	27									
Nebraska	15.8	−6.8	Alliance	74	24	Winnebago	−45	2	0.76	+0.06	Plattsmouth	1.92	Fort Robinson	0.02
Nevada	37.8	+2.4	Caliente	80	22	Wells	−37	12	1.13	+0.07	Lewers Ranch	4.45	Sodaville	0.00
New England*	17.1	−7.5	Framingham, Mass.	54	21, 22	Van Buren, Me.	−32	2	1.53	−2.28	Jacksonville, Vt.	3.31	Enosburg Falls, Vt.	0.54
New Jersey	23.4	−7.2	Flemington	57	21	River Vale	−18	5	2.53	−1.58	Bridgeton	3.96	2 stations	0.87
New Mexico	35.0	−2.1	Carlsbad	76	24	Cimarron	−35	12	1.92	+1.81	Alma	6.06	Eagle Rock Ranch	0.37
New York	16.2	−6.2	Otto	55	26	Paul Smiths	−32	5	1.45	−1.14	Palermo	4.22	Harkness	0.24
North Carolina	34.2	−8.6	Henrietta	69	26	Linville, Marshall	−8	14	5.49	−1.05	Selma	7.80	Marshall	2.45
North Dakota	8.2	−1.4	Forman	64	23	Ashley	−46	2	0.30	−0.21	Coal Harbor	0.81	5 stations	T.
						Dunseith	−46	12						
Ohio	20.8	−6.5	Shenandoah	54	8	Millport	−22	3	1.58	−1.16	Green	2.64	Orangeville	0.50
Oklahoma and Indian Territories.	28.0	−10.4	Meeker, Okla.	78	26	Cleo, Whiteagle, Okla.	−25	13	1.35	+0.01	Blackburn, Okla.	6.00	Enid, Okla.	0.15
Oregon	37.6	+0.5	Fairview	80	25	Pine	−27	12	2.07	−3.03	Nehalem	7.27	2 stations	0.13
Pennsylvania	20.8	−6.7	Uniontown	59	12	Smethport	−24	5	1.70	−1.61	Browers Lock	2.83	Towanda	0.44
Porto Rico	73.3	.....	Central, Aguirre	94	25	Aibonito	46	23	1.93	.....	Barros	4.46	Juana Diaz	T.
South Carolina	38.9	−7.7	Yemassee	72	20	Walhalla	0	14	5.21	+0.87	Blackville	8.20	Barksdale	2.87
South Dakota	12.1	−2.9	Cavite, Greenwood	69	28	Cavite, Ramsey	−48	2	0.41	−0.12	Elk Point	1.50	3 stations	T.
Tennessee	31.3	−9.2	Carthage	70	26	Benton	−28	14	4.10	−0.62	Benton	8.65	Wildersville	1.25
Texas	39.2	−10.0	Gatesville	89	24, 25	Claude	−16	13	2.61	+0.81	Orange	7.01	Texline	0.50
Utah	30.5	−2.1	St. George	73	26	Woodruff	−35	12	1.67	+0.38	Ranch	7.60	Kelton	0.02
Virginia	28.6	−7.5	Bedford City	63	24	McDowell	−16	14	3.37	−0.25	Blacksburg	6.07	McDowell	0.17
Washington	34.4	−0.2	Hatton	76	24	Cusick	−22	10	1.88	−1.74	Clearwater	10.30	Horse Heaven	0.05
West Virginia	25.6	−6.0	Williamson	56	25	Philippi	−22	3	2.34	−1.11	Logan	4.65	Moorefield	0.80
Wisconsin	10.8	−5.0	Hillsboro, Grantsburg	51	28	Hayward	−38	3	1.15	−0.04	Sheboygan	3.20	New Richmond	0.30
Wyoming	16.8	−4.1	Easton's Ranch	70	21	Grand Canyon, Soda	−53	12	0.54	−0.23	Green River	2.14	Basin	T.
			(Wolf P. O.)			Butte (Y. N. Park)								

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

month, placing the ground in excellent condition. The low temperature and excess of snow were rather unfavorable for stock, but the loss was generally small.——*G. A. Loveland.*

Nevada.—Weather mild and pleasant the greater part of the month. Range feed very good. Live stock in excellent condition. Snow in the mountains deficient and prospects for water rather discouraging. Plowing in southern and western sections latter part of the month. Fruit trees and vegetation well advanced in southeastern portion—*J. H. Smith.*

New England.—February was exceptionally cold, but was otherwise a pleasant winter month, there having been many more fair and sunny days than generally experienced at this season. The temperature was uniformly rather than extremely low, February in some other years having given considerably lower minimum records. The weather was generally favorable for the midwinter industries of the section, and the covering of snow and ice on the ground afforded protection for grass and winter grain.—*J. W. Smith.*

New Jersey.—Wheat, rye, and grass were well protected by a good blanket of snow. Fruit trees were still dormant; peach and pear trees, in places, were badly infested with San Jose scale; injury to peach buds by severe cold was slight.—*Edward W. McGann.*

New Mexico.—Rain or snow fell in abundance and thoroughly saturated the soil, and many streams at the close of the month were at flood tide and all flowing freely, while lakes and water holes were filled. Exceedingly low temperatures occurred over the mountain slopes and mesas of the eastern portion on the 12th and 13th, breaking all previous records and caused some injury to fruit buds. During the latter part of the month warm and favorable weather started grass and alfalfa, and in southern portions fruit trees were beginning to bloom. Range stock was generally in good condition and losses had been few.—*J. B. Sloan.*

New York.—The weather conditions during the month were favorable for agricultural and horticultural interests. The temperature was considerably below the normal, but there was no alternate thawing and freezing. Wheat and rye were well protected by snow, and fruit buds were apparently uninjured. Water was reported to be low in many localities, but promised to be replenished by the melting snow. Farm stock came in fairly good condition. Deep snow interfered with travel and delayed work in some sections.—*H. B. Hersey.*

North Carolina.—Owing to the continuous cold weather and frequent rains and sleet which characterized the month of February, practically no farm work of any kind was accomplished; no plowing or planting even of truck crops was done. Wheat, oats, and rye remained very backward in growth, hardly showing above ground, but were thought to have secured good root development. Clover was much damaged. Fruit trees showed no signs of blooming. All farm work was behind, especially the planting of early truck crops.—*C. F. von Herrmann.*

North Dakota.—The forepart of the month was very cold, and during

that period stock on the ranges suffered considerably. After the 15th much warmer weather prevailed, and the close of the month found all live stock, as a rule, in excellent condition.—*B. H. Bronson.*

Ohio.—The temperature during the first two-thirds of the month averaged about 15° below normal, but during the remainder it was about normal. The precipitation also was deficient. The ground was well covered with snow, especially during the coldest portion of the month. Wheat, rye, meadows, and pastures were well protected, although some damage occurred by top freezing. Peach buds were injured somewhat in the southwest. Tobacco shipping was delayed by lack of moisture and warmth.—*J. Warren Smith.*

Oklahoma and Indian Territories.—February was marked by the lowest temperatures on record at many points, the monthly mean temperatures ranging from 6° to 13° below the normal. A thick covering of snow protected and benefited wheat and placed it in fair to good condition. Ground was in fine condition for spring work and was thoroughly saturated. Stock was in poor to fair condition and suffered considerable loss during severe cold. Apricots, peaches, pears, and berries were badly winter killed, other fruit in fair condition.—*C. M. Strong.*

Oregon.—The coldest weather of the winter occurred during the first half of the month. The latter part was warmer than usual, and there were several periods of warm, sunshiny weather. The precipitation, while deficient in all sections, came at opportune times, and was of great benefit. Wheat, rye, and oats came through the cold weather practically uninjured, and at the close of the month all fall sown grain was unusually promising.—*A. B. Wollaber.*

Pennsylvania.—The mean temperature for the month was the lowest in the last eighteen years. The average precipitation was the least since 1901 and was only 56 per cent of the seventeen-year normal. The average snowfall was 9.5 inches as against 6.7 last year. Winter grain was amply protected and was thought to be uninjured.—*T. F. Townsend.*

Porto Rico.—The rainfall was light, but generally sufficient to keep crops in good condition, except in the southern division where young canes and pastures were drying up. Sugar making continued throughout the month without interruption, and the grade of juice obtained was good, except in a few places where the wet weather of January prevented the canes from maturing well. Much cane was planted. Considerable cotton was picked; yield good. Coffee trees blossomed well. Tobacco cutting was active and a good crop was being obtained. Pineapples promised a good crop. Pasturage was scarce in places, and cattle were suffering.—*E. C. Thompson.*

South Carolina.—The month was cold and wet. The precipitation was largely in the form of mixed snow, sleet, and rain, which froze as it fell, melted slowly, and thoroughly saturated the soil. Freezing damaged oats somewhat, but not wheat nor fruit buds, which remained dormant. Truck planting was seriously delayed and growth of such as was up was checked. Some tobacco seed beds were burnt and seeded. The closing week was mild and pleasant, and plowing and preparations for early planting made good progress.—*J. W. Bauer.*

South Dakota.—The forepart of the month was very cold, two stations recording a minimum temperature of – 48° on the 2d. Generally favorable conditions for live stock prevailed after the 16th; before that date, however, snow on the ground and severe cold necessitated heavy feeding of sheltered stock and reduced flesh on range stock, but only normal actual losses on the ranges were indicated. Winter rye and the limited acreage of winter wheat were protected by snow during the severe weather and no injury therefrom was reported.—*S. W. Glenn.*

Tennessee.—Abnormally low temperature and hard freezing wrought serious damage to winter grains, but in many sections snow protected the young plants. Wheat sown early, especially that which was drilled and fertilized, stood the winter fairly well, but late sown was badly uprooted by the freezes. Winter oats and fall grasses were badly killed. Little or no farm work was done during the month.—*H. C. Bate.*

Texas.—Unusually cold and wet weather prevailed during the first two decades, and a cold wave of great severity swept across the State early in the second decade. During the third decade the weather was fair and moderately warm. Farm work was greatly retarded by unfavorable weather, but conditions were more favorable by the end of the month. Winter grains were injured by severe weather, but favorable weather later caused improvement. Soil was well supplied with moisture, but spring seeding was delayed. Severe weather caused some damage to garden truck and some loss of cattle.—*M. E. Blystone.*

Utah.—Abnormally high temperatures prevailed, except during the middle of the month when a very severe cold wave occurred. Rain and snow fell during the first decade, the amounts being moderate over the northern portion and heavy to excessive over the middle and southern sections. Winter grain was generally in good condition, though in some few localities somewhat damaged. The range was fine and stock thriving. Some fruit reported winter killed. Considerable plowing and sowing was done.—*R. J. Hyatt.*

Virginia.—The periods of cold weather occurring throughout the month were more than ordinarily prolonged, and, while lower absolute temperatures have been recorded in February of other years, notably 1895 to 1899, there was but one with the temperature as low. Fortunately, precipitation came mostly as snow, which remained on the ground and furnished excellent and continuous protection to all fall sown crops.—*Edward A. Evans.*

Washington.—Month not generally favorable to crops. Severe freezing 10th to 17th badly injured winter wheat in localities where ground was bare, and injured peach and apricot buds in localities of southeast counties. Warm weather after 20th took snow and frost from ground, except in northern counties, causing winter wheat to grow vigorously. Where wheat came up in the fall and was not injured by frost the stand was good, although the wheat was short. Some fall sown did not germinate, and resowing was necessary.—*G. N. Salisbury.*

West Virginia.—Cold weather prevailed during the greater part of the month, and the ground was frozen very deep. The snowfall was generally sufficient to afford protection to wheat and rye, but the prospects for these crops were very poor. Stock looked well and the feed on hand was thought to be sufficient. No plowing or other farm work was done.—*E. C. Vose.*

Wisconsin.—Decidedly cold weather prevailed throughout the State during the first half of the month, but as there was an ample covering of snow winter grains and grasses were thoroughly protected and suffered no injury. The temperature conditions were much more moderate during the latter part of the month. The snowfall for the State averaged 11.9 inches, which is about normal.—*W. M. Wilson.*

Wyoming.—The first half of the month was unusually cold, culminating on the 12th in one of the most severe cold waves ever experienced in the State. The latter half of the month was very mild and pleasant. Notwithstanding the severe cold weather, stock losses were very light, and were confined to the southeastern counties of the State, where the snowfall was the heaviest and where for a few days stock found it difficult to secure sufficient feed.—*W. S. Palmer.*

SPECIAL ARTICLES.

A RELATION BETWEEN AUTUMNAL RAINFALL AND THE YIELD OF WHEAT OF THE FOLLOWING YEAR—PRELIMINARY NOTE.

By W. N. SHAW, Sc.D., F.R.S., Secretary of the Meteorological Council.

[Read before the Royal Society, February 2, 1905.]

By autumn, in this note, is to be understood the period from the thirty-sixth to the forty-eighth week, both inclusive, of the year, as represented in the Weekly Weather Report of the Meteorological Office; it covers the months of September, October, and November, approximately. The rainfall to be referred to is the average amount in inches, for the "principal wheat producing districts," for the period mentioned, in successive years. The amounts are taken from the summaries of the Weekly Weather Report.

The yield of wheat is that given for successive years in the annual summaries of the Board of Agriculture and Fisheries as the average yield in bushels per acre for England since 1884, or more strictly since 1885, as that is the first year for which the figures for England are given separately. In 1884 the figure for Great Britain, which generally differs but little from that for England, is used.

These are the only figures in the official publications which are immediately available for the purposes of comparison. The totals of rainfall for the thirteen weeks have been compiled from the weekly amounts; otherwise the figures are taken as they stand in published returns. The areas referred to are not exactly coterminous, but they are more nearly so than if the rainfall values had been taken for the whole of England, or the wheat yield for Great Britain.

When the autumn rainfall and the yields of wheat for successive years from 1884 to 1904, as thus defined, are plotted, the rainfall curve being inverted, i. e., rainfall being measured downward on the paper while yield is measured upward, there is a very striking similarity between the curves, so much so as to suggest that if the scales were suitably chosen the two curves would superpose and show general consonance, with exceptions, more or less striking, in a few of the years. In other words, the yield of wheat in any year seems to depend mainly on the absence of rainfall in the previous autumn, and but little on any other factor.

The obvious algebraical expression for such a condition as the curves represent is a linear equation, and the equation

which represents the relation between yield of wheat for England and the previous autumn rainfall is:

Yield = 39.5 bushels per acre — 5/4 (previous autumn rainfall in inches).

If we call the yield obtained from the rainfall by this equation the "computed yield," a comparison with the actual yield for the twenty-one years shows that the computed yield agrees with the actual yield within half a bushel in seven years out of the twenty-one. In fourteen years the agreement is within two bushels; in the remaining seven years the difference between computed and actual yield exceeds two bushels. The extreme variation of yield in the twenty-one years is nine bushels, from 26 bushels per acre in 1892 and two other years, to 35 bushels per acre in 1898.

Of the seven years for which the formula gives yields differing from the actual by upward of two bushels, 1896 is the most conspicuous; its actual yield exceeds the computed yield by 4.5 bushels.

These seven years all show anomalous seasons. Taken *seriatim*, they are 1887, 1888, 1893, 1895, 1896, 1899, and 1903.

In 1888 and 1903 the crops were washed away by ten inches of rain in the summer; 1893 is the year of phenomenal drought and the crop was below the computed figure by 2.5 bushels. The years 1892 and 1899 are interesting, because, though the amounts of rain were up to the average, the former had eight dry weeks and the latter ten dry weeks out of the thirteen included in the conventional autumn. They were thus dry autumns, the average amount of rainfall being made up by a few exceptionally wet weeks. The yields correspond with dry autumn values. They are above the average and above the computed figures by some two or three bushels per acre.

There remain 1895 and 1896; 1895 was the year of remarkably cold weather, and in that year the yield fell short, but in the following year the deficiency was made up by a yield as much above the computed value as the previous one fell short. It would appear that in this instance the productive power not utilized in the year of the great cold was not lost but stored. On the other hand, it must be remarked that 1896 had the advantage of a specially dry winter.

It appears from these considerations that the dryness of autumn is the dominant element in the determination of the yield of wheat of the following year. The averages of yield and of rainfall are taken over very large areas, and it may be taken for granted that the investigation of the question for more restricted areas would introduce some modification in the numerical coefficients, if not in the form of the relation.

The data for making such an investigation are not yet in an available form. A comparison has been made between autumnal rainfall for "England, East" and the average yield for the counties of Cambridge, Essex, Norfolk, and Suffolk, which shows a similar relation but a magnified effect of autumnal rainfall upon the crop, and also two exceptional years which have not yet been investigated.

CONTRIBUTIONS TO MARINE METEOROLOGY.

Two important contributions to the meteorology of the sea have recently appeared:

1. *Observations océanographiques et météorologiques dans la région du courant de Guinée. (1855-1900.) I. Text et tableaux. II. Planches.* Utrecht. 1904.

This work, which is published by the Royal Meteorological Institute of the Netherlands, is a thorough discussion of the winds, currents, air pressure, air temperature, number of rainy days, surface temperature, and density of sea water for the region indicated in the title. All the above-named features are fully charted. The region covered by this work lies between the parallel of 25° north and the equator, and the meridians of 0° and 40° west.

2. *Wind charts for the South Atlantic Ocean.* Published by the Hydrographic Department of the British Admiralty, January, 1904.

These charts embrace the region lying between the equator and 65° south latitude, and between the meridians of 20° east and 90° west. Except for small areas in the extreme south of this region, for which observations are lacking or insufficient, wind-roses are given for each 5-degree square; and many useful notes are added regarding local peculiarities of wind and weather. The charts include isobars and isothems. The introduction contains a very interesting and practical discussion of the meteorology of the whole region, together with charts showing the distribution and frequency of fog. This work embodies the results of nearly a million observations. Some portions of these results, dealing with the regions adjacent to the South American coast, were published in 1902.—*C. F. T.*

HIGH WATER IN THE GREAT LAKES.

By Prof. ALFRED JUDSON HENRY.

Very great interest has recently centered in the fluctuation in level of the Great Lakes during the last ten years, the revival in interest being directly due to the unusually high water of 1904. A decided rise in level above what may be called normal stages means greatly increased earning capacity, especially for the larger vessels afloat on these inland seas. In a recent issue of the Chicago Chronicle comparisons were made between low water of 1895 and high water of 1904. The extreme range, about three feet, was shown to have occurred on Lake Ontario, and the least range, about one-tenth of a foot, on Lake Superior. The rise on Lakes Michigan and Huron from 1895 to 1904 was shown to have been a little over a foot and a half and on Lake Erie nearly two feet. It should be remembered in this connection that the low water of 1895 was the culmination of one of the greatest droughts this country has ever experienced. In that year severe and prolonged drought centered in the Lake region and the Middle Atlantic States, and the lowest water of a quarter of a century was reached in many of the rivers and small streams. This period of drought was followed by years of plentiful precipitation, and the Great Lakes, as well as the rivers, returned to normal conditions.

Two distinct series of oscillations are recognized on the Great Lakes. The first consists of the annual rise of the waters to a maximum stage in summer, followed by a decline to a minimum stage in winter or spring. The second series is superposed upon the first, and generally extends through a period of several years. It is illustrated on the diagram, fig. 1, by the upward tendency shown on the curve for Lakes Michigan and Huron from 1896 to 1899; also on the curve for Lake Erie, wherein, it will be noticed, the crest or flood stage for each year from 1895 to 1898 is somewhat higher than for the year immediately preceding.

The annual rise in the Great Lakes begins with the breaking up of ice in the tributary rivers and small streams, and the maximum or flood stage is generally reached in midsummer. Owing to marked climatic differences between the northern and southern portions of the Lake region, the spring rise begins about a month and a half earlier on Lake Erie, the most southern lake, than it does on Lake Superior, the most northern. The time of high water on the last-named lake is also from one to three months later than on Lake Erie. The period of replenishment on all of the lakes, except Superior, is from March to June; on Superior from April to September. As soon as high water is reached the lakes begin to fall, slowly at first, but quite rapidly as the winter season approaches.

The annual rise and the nonperiodic variations are doubtless due to atmospheric influences, the most important of which are precipitation, temperature, and evaporation. Changes in lake level may be also due to other causes, such as an increase

in the cross section of the outlet or an undue amount of ice in the river channels. Changes in level due to alterations in the outlets of Lakes Huron and Erie are more or less probable. Lake Superior, however, is so situated with respect to its outlet that it should respond rather freely to the atmospheric conditions that prevail over its watershed. For that reason particular attention will be paid in what follows to fluctuations in that lake.

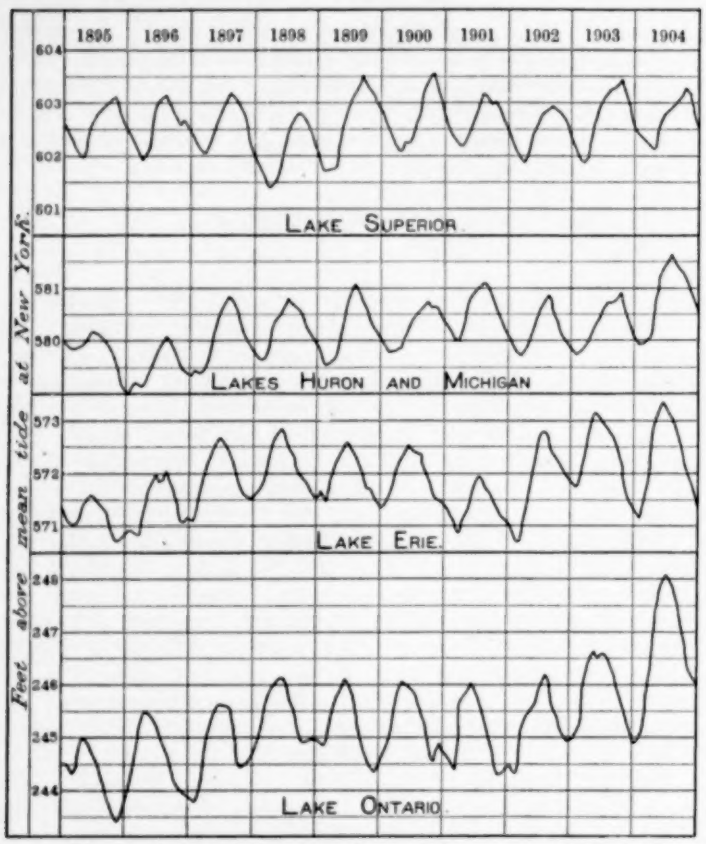

Fig. 1.—Fluctuations in level of the Great Lakes from 1895 to 1904. (By courtesy of the United States Lake Survey.)

The accompanying diagram, fig. 1, shows the fluctuations in level of the Great Lakes from 1895 to 1904. The diagram is based upon the corrected lake levels as reported by the United States Lake Survey, except that final readings for 1904 are not yet available. The low water of 1895 and 1896, as shown by the diagram, was due to adverse atmospheric conditions, viz: persistent drought coupled with periods of abnormally high temperature and greatly increased evaporation. The period of replenishment in 1895 brought very little water into the lakes. The inflow of Lakes Michigan and Huron, which in a normal year is sufficient to raise the level of those lakes a little more than a foot, caused a rise in that year of less than half a foot. Assuming that the discharge through the St. Clair River and the loss by evaporation were not greater than in former years, it will readily be seen that the winter minimum, by reason of the greatly reduced summer maximum, must be considerably lower than for the previous year, as was actually the case. To overcome the loss of water in Lakes Michigan and Huron, due to the adverse conditions extending through several years, it is necessary that favorable conditions prevail for a corresponding term. As may be seen from the diagram, high water was not reached until 1899.

The drought was not so severe in the Lake Superior watershed as in more southern districts, and that lake did not fall much below the mean level until the winter of 1897–8. The latter part of 1897 was very dry, and this period of dryness was followed by an exceptionally warm, open winter. The effect of a warm winter is to greatly increase the opportunity for evaporation. As elsewhere shown by the writer, the difference between the possibilities of evaporation in a very warm winter and a very cold winter, in the Lake Superior region, may amount to 3.5 inches. The winter of 1898–9, succeeding the dry season of 1897–8, was colder than the average, with precipitation rather below the normal until March, 1899, when heavy snow fell. The writer had occasion to say (Lake Chart, 1899, W. B. No. 213) in discussing the high water that occurred on Lake Superior in 1899:

> The precipitation in the Lake Superior basin and on the lake itself was a little more than 29 inches, or about an inch above the normal. In some parts of the basin, as on the Keweenaw Peninsula, there was an excess of from six to eight inches. On the Canadian side, the greatest excess occurred at White River, diagonally across the lake from Keweenaw Point. We may therefore infer that over a considerable portion of the surface of the lake the precipitation exceeded the normal by at least three inches.
>
> The snowfall of the season, October, 1898, to May, 1899, averaged for the whole basin 78.1 inches, of which 26 per cent fell during March, 1899. The cold weather during the first half of April prevented the snow from rapidly disappearing and retarded evaporation. It is quite probable, therefore, that when the snow did melt a large proportion of it eventually found its way into the lake.

In 1900 Lake Superior reached practically the same height as in 1899, although the result was attained in a different way, as may be gleaned from the following excerpt from the Lake Chart for 1900 (W. B. 237):

> The winter precipitation was deficient in the upper Lake region, especially in the watersheds of Lakes Superior and Huron. The snowfall on the average for these lakes, including land areas tributary thereto, was about a foot and a quarter less than during the preceding winter. The spring and early summer rains likewise fell short of the normal, by small amounts it is true, yet the accumulated deficiency in the Lake Superior basin from November 1, 1899, to June 30, 1900, was about five and a half inches. The computed evaporation for the same period at Duluth was 15.5 inches as against 12.4 for the corresponding period of the preceding year; Marquette, 13.5 inches as against 10.9 for the preceding year; Saulte Ste. Marie, 13.0 as against 9.0 for the preceding year.
>
> The level of Lake Superior for November, 1899, was 602.68 feet above mean tide at New York City, the highest mean level for that month reached since 1876. The changes in level during subsequent months, according to observations made by officials of the United States Lake Survey, are as follows:

Changes in level of Lake Superior with precipitation departures, December, 1899, to December, 1900.

Date.	Rising or falling.	Precipitation above or below normal.	Date.	Rising or falling.	Precipitation above or below normal.
	Feet.	*Inches.*		*Feet.*	*Inches.*
December, 1899	—0.21	+0.6	July, 1900	+0.18	+1.1
January, 1900	—0.39	—0.2	August, 1900	+0.36	+2.0
February, 1900	—0.19	—0.3	September, 1900	+0.52	+2.4
March, 1900	—0.22	—0.2	October, 1900	+0.08	—0.5
April, 1900	—0.10	—0.7	November, 1900	—0.03	
May, 1900	+0.17	—1.6	December, 1900	—0.38	
June, 1900	+0.06	—1.4			

Thus we see that the level of the lake fell continuously until May, when a rise of 0.17 foot, about half the normal rise for that month, was noted. The normal rise, May to June, is 0.30 foot; the actual rise was 0.06 foot. Precipitation, as may be seen from the above table, was continuously below normal from January to June, both inclusive, but beginning with July and continuing through August and September, heavy rains fell in the Superior watershed, the accumulated excess for the three months being 5.5 inches. The computed evaporation during the same months was about the same as for the corresponding period a year ago. Assuming that the discharge through the St. Marys River was normal, the excess of rain that fell on the water surface of the lake above evaporation must have caused the marked increase in level shown in the table over and above the normal increase, July to October. The normal rise of the latter period is but 0.07 foot. The actual increase was 0.96 foot. Deducting the normal increase, there still remains a rise in the level of the lake of about eleven inches from July to October. It is difficult to attribute this rise to any other agency than the actual precipitation on the lake surface.

In the same year, as may be noted by the diagram, the level of Lakes Michigan and Huron fell considerably short of that

reached the year previous. The atmospheric precipitation in both basins, particularly the snowfall, was below the average.

Passing now to the high water of 1904, it may be remarked that the atmospheric conditions of the winter of 1903-4 and during the spring of 1904 were such as would conspire to produce high water on the Great Lakes.

The winter of 1903-4 was characterized by severe and continuous cold weather and heavy snow. The latter blanketed practically the whole of the several watersheds and increased in depth as the winter progressed, since there was practically no loss except by evaporation. The snowfall was very heavy in the Lake Huron basin, especially on the higher lands of Ontario, immediately east of Lake Huron. This district was covered in December by a snow covering that probably averaged four feet in depth. In January and February, owing to the absence of thaws, the thickness of the snow covering increased. At the end of February, 1904, the entire Lake region, save the extreme southern portion, was covered by snow, the depth ranging from 5 to 60 inches. In March, although the weather in the southern portion of the Lake region moderated somewhat, cold, stormy weather, with considerable snow, continued in Canadian districts and in northern Wisconsin and northern Michigan. At the close of that month there were from 24 to 30 inches of snow on the ground in Muskoka and Nipissing districts. In southern Ontario, while the remains of drifts were still to be seen, the snow had practically disappeared. On the United States side, except in northern Michigan and northern Wisconsin, there was no snow on the ground.

In April the weather on the Canadian side was exceedingly cold and wet; the temperatures went well above the freezing point in the daytime, but the night temperatures were low enough to cause frost or freezing, especially in northern districts. The ice in the streams of southern and central Ontario broke up about the first of the month; in the Lake Superior watershed and north of Georgian Bay there was very little thawing until near the close of the month.

The stage of water on all of the lakes during the season of navigation just closed was higher than has been experienced for a number of years, the single exception being Lake Superior, which was not quite so high as in 1899, 1900, or 1903. The greatest rise, as compared with 1903 stages, occurred on Lakes Michigan, Huron, and Ontario. The last named for July, 1904, was three and one-half feet above the stage for the corresponding month of 1895, and both Lakes Huron and Michigan were considerably more than a foot above the July stages of that year.

More water came into the lakes, except possibly Superior, this year than for a number of years previous. The rise in Michigan from March to April was a little less than six inches; on Huron a little more than six inches; on Erie about thirteen inches, while on Ontario it was a little over fifteen inches. These figures, however, because of the varying size of the lakes, give no idea of the actual amount of water that flowed into the respective lakes. Remembering that a sheet of water an inch in thickness weighs 72,516 tons (of 2000 pounds each) per square mile, we can easily reduce the inflow of the several lakes to a convenient unit of comparison. Selecting a cubic mile of water as such unit and reducing the increase in level from March to April to terms of that unit, we find that the increase in the level of Lake Huron, roughly speaking, amounted to 2.2 cubic miles of water; Lake Michigan, 1.9; Lake Huron, 2.1; Lake Ontario, 1.9. For the period of replenishment the inflow into Lake Superior was approximately 6.6 cubic miles; Michigan, 5.4; Huron, 6.7; Erie, 2.7, and Ontario, 3.5.

In the opinion of the writer, based on the meteorological conditions that have prevailed during the winter just closed, the outlook for the coming season of navigation is not favorable to a continuation of the high water of 1904, although the season will probably rank as one of relatively high water, especially on the upper lakes. The difference between the levels of 1904 and 1905, due to atmospheric conditions, will naturally be most pronounced on Lakes Erie and Ontario where they may amount to half a foot or more.

RECENT PAPERS BEARING ON METEOROLOGY.

Mr. H. H. KIMBALL, Librarian and Climatologist.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——

American Journal of Science. New Haven. 4 series. Vol. 19.

—— Possible variation in solar radiation. [Extract from report of S. P. Langley.] Pp. 246–248.

Astrophysical Journal. Chicago. Vol. 21.

Maunder, E. Walter The solar origin of terrestrial magnetic disturbances. Pp. 101–115.

Hale, George E. A study of the conditions for solar research at Mount Wilson, California. Pp. 124–150.

Hale, George E. The solar observatory of the Carnegie Institution of Washington. Pp. 151–172.

Geographical Journal. London. Vol. 25.

Crostwait, H. L. A journey to Lake San Martin, Patagonia. Pp. 286–291.

Herbertson, A. J. The major natural regions: an essay in systematic geography. [Climate.] Pp. 304–306.

Journal of the Franklin Institute. Philadelphia. Vol. 59.

—— Magnetic storms and sun spots. [Note on work of E. W. Maunder.] P. 216.

Knowledge. London. New Series. Vol. 2.

Shackleton, W. The coming total eclipse. Pp. 45–47.

—— Radium, the cause of the earth's heat. [Note on article of E. Rutherford.] P. 61.

Proceedings of the Royal Society. London. Vol. 74.

Cave-Browne-Cave, F. E. On the influence of the time factor on the correlation between the barometric heights at stations more than 1000 miles apart. Pp. 403–413.

Quarterly Journal of the Royal Meteorological Society. London. Vol. 31.

Boyds, Charles W. R. Meteorological observing in the Antarctic regions. Pp. 1–14.

Brodie, Frederick J. Decrease of fog in London during recent years. Pp. 15–28.

—— Discussion of meteorological observations in relation to solar phenomena. P. 28.

Holmes, R. L. Hurricane in Fiji, January 21–22, 1904. Pp. 29–38.

Thomas, J. Lynn. Two cases of lightning-stroke, July 17, 1903. Pp. 55–60.

—— A legal decision as to damage by lightning and wind. Pp. 60–62.

—— Speculation in rain. P. 62.

Assmann, —. A kite struck by lightning at Hamburg. [Translation of note of Assmann.] P. 75.

School Science and Mathematics. Chicago. Vol. 5.

Cox, Henry J. Recent advances in meteorology. Pp. 159–167.

Scientific American. New York. Vol. 92.

Putnam, B. L. Grandfather's barometer. P. 179.

Scientific American Supplement. New York. Vol. 59.

Eliot, John. Meteorology in the British Empire. Pp. 24373–24374.

Eliot, John. Meteorology in the British Empire. P. 24386.

Clerke, Agnes M. Our solar system. Pp. 24386–24387.

Science. New York. Vol. 21.

Rotch, A. Lawrence. The temperature and drift of the air at great heights above the American Continent, obtained by means of registration balloons. [Preliminary report.] P. 335.

Ward, R. DeC. The teaching of meteorology. [Note on address of Cleveland Abbe.] Pp. 336–337.

Ward, R. DeC. Meteorological results of the Blue Hill kite work. [Review of work of H. H. Clayton.] Pp. 433–435.

Symons's Meteorological Magazine. London. Vol. 40.

—— The high barometer of January, 1905. Pp. 2–6.

Bonacina, L. C. W. The great problem of meteorology. Pp. 7–10.

Shaw, W. N. Autumn rainfall and yield of wheat. Pp. 10–12.

—— Our rainfall averages. Pp. 14–15.

Science Abstracts. London. Vol. 29.

Eb[ert, H.] Luftelektrische Messungen bei zwei Ballonfahrten. [Abstract of work of H. Gordien.] Pp. 208–209.

La Nature. Paris. 33me année.

R., L. R. Un nouvel observatoire d'astronomie physique. Pp. 161–162.

Viret, L. La bise du 1er au 3 janvier 1905. Pp. 175–176.

Rudaux, Lucien. La grande tache solaire. P. 208.

Rudaux, Lucien. Le vent et les arbres. Pp. 212–213.

Ciel et Terre. Bruxelles. 25me année.

Arctowski, Henryk. La météorologie des régions antarctiques et la coopération internationale dans les explorations polaires. Pp. 581–585.

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Violle, J. Sur l'action des canons paragrêles. Pp. 342–343.

Féry, Ch. Thermomètre intégrateur. Pp. 367–368.

Guillaume, J. Observations du soleil faites à l'Observatoire de Lyon (équatorial Brunner de 0m, 16) pendant le quatrième trimestre de 1904. Pp. 420–422.

Nordmann, Charles. Enregistreur à écoulement liquide de l'ionisation atmosphérique. Pp. 422–425.

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Rutherford, E. Les probèmes actuels de la radioactivité. Pp. 125–150.

Gockel, A. Sur l'émanation radioactive de l'atmosphère. Pp. 151–158.

Annalen der Hydrographie und Maritimen Meteorologie. Berlin. 33 Jahrgang.

Bebber, W. J. van. Bemerkenswerte Stürme. Pp. 49–55.

Möller, Johannes. Beobachtungen von Dämmerungserscheinungen, angestellt auf See. Pp. 55–58.

Lütgens, —. Einfluss des Windes auf die Dichte und die Bewegung des Meerwassers. [Abstract of work of J. W. Sandström.] Pp. 82–84.

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Dadourian, H. M. Die Radioaktivität der Bodenluft. Pp. 98–101

Rebenstorf, H. Ueber das Verhalten der Schwefelsäure bei der Bildung von Nebeln. Pp. 101–107.

Gaea. Leipzig. 140 Jahrgang.

—— Luftelektriziät, Eigenladung der Erde und Aktivität der freien Luft. Pp. 132–136.

—— Drachenaufstiege auf dem Bodensee. Pp. 136–140.

—— Die Dämmerungserscheinungen der Jahre 1903 und 1904. [Review of work of W. Laska.] Pp. 179–180.

Illustrirte Aeronautische Mitteilungen. Strassburg. 9 Jahrgang.

—— Die Luftschiffahrt auf der Weltausstellung in St. Louis 1904. II. Pp. 33–39.

E. Die Tätigkeit des aeronautischen Observatoriums des Kgl. meteorologischen Instituts im Jahre 1904. Pp. 40–41.

Geographische Zeitschrift. Leipzig. 11 Jahrgang.

Schlüter, Otto. Das österreichisch-ungarische Okkupationsgebiet und sein Küstenland. Eine geographische Skizze. III. Das Klima. Pp. 99–103.

Himmel und Erde. Berlin. 17 Jahrgang.

Lendenfeld, Robert von. Ueber die Ursachen der Wüstenbildung.

Axmann, —. Physiologie des Wetters. Pp. 219–234.

Das Wetter. Berlin. 22 Jahrgang.

Kassner, E. Der Globus in der Meteorologie. Pp. 25–32.

Sieberg, August. Erdbeben und Witterung. Eine Studie über tellurische Dynamik. Pp. 32–34.

Hennig, R. Sturmfluten der Ostsee. Pp. 34–36.

Lancaster, A. Der grosse Hitze und Trockenheit im Juli 1904. Pp. 38–41.

Schwenck, Otto. Das Verhalten der Gewitterböen beim Passieren von Flussläufen in der kalten Tages und Jahreszeit. Pp. 42–43.

—— Meteorologische Station zu Lüdenscheid. Pp. 43–45.

Meteorologische Zeitschrift. Wien. Band 21.

Gallenkamp, W. Ueber den Verlauf des Regens. Pp. 1–10.

Szalay, L. v. Ueber die Empfindlichkeit der Gewitterapparate. Pp. 10–22.

Quervain, A. de. Bericht über die IV. Konferenz der internationalen Kommission für wissenschaftliche Luftschiffahrt in St. Petersburg. Pp. 22–26.

Wundt, W. Ueber die Superposition von Zyklonen. Pp. 26–27.

Johansson, Oscar V. Zur Definition des Rauhfrostes und Glatteises. Pp. 27–29.

Hann, J. Genäherte Berechnung des jährlichen Ganges der Temperatur aus den Mitteln der Jahreszeiten. Pp. 29–30.

Hann, J. Regenfall zu Greenwich 1815–1903. Pp. 30–32.

—— Resultate der meteorologischen Beobachtungen auf dem Ben Nevis und zu Fort William im Jahre 1903. Pp. 32–33.

—— Ergebnisse der meteorologischen Beobachtungen im Jahre 1903 in Manila. P. 33.

—— Meteorologische Beobachtungen zu Tanger, Marokko, 1899–190, und auf Neu-Kaledonien 1891–1901. P. 33.

—— Magnetische Elemente für Potsdam. P. 34.

—— Niederschlagsmengen in Transvaal. P. 34.

—— Regenmessungen auf den Fidschi-Inseln. P. 34–35.

—— Ergebnisse der meteorologischen Beobachtungen zu Aneud, 1900 bis 1902. P. 35.

Hann, J. Zum Kilma von Niederländisch-Ostindien. Pp. 35–36.

—— Meteorologische Beobachtungen zu Pasuruan in Ostjava. Pp. 37–39.

—— Jährliche Periode der Erdbeben im indischen Archipel. P. 39.

—— Resultate der meteorologischen Beobachtungen an der Küste des französischen Kongostaates, 1899–1901. Pp. 39–40.

Hann, J. Regenfall in Montpellier in der Periode 1873–1903. Pp. 40–41.

Hann, J. Bodentemperatur zu Harestock und Southport. Pp. 41–42.

—— Polis über den tägl. Gang der Temperatur zu Aachen an heiteren und trüben Tagen und die stündliche Anderung der Temperatur. Pp. 42–43.

—— Gewitter in Dänemark. P. 43.

Wolfer, A. Provisorische Sonnenflecken-Relativzahlen. P. 43.

—— Klima von Jerusalem. P. 43.

Hemel en Dampkring. Amsterdam. 2 Jahrgang.

Nell, Chr. A. C. De weervoorspelling met behulp van locale waarnemingen. Pp. 147–151.

Mars, S. De algemeene circulatie van den Dampkring. Pp. 151–157.

Boletim da Sociedade de Geographia de Lisboa. Lisboa. 22 Série 1904.

Berthoud, Paul. Météorologie de Lourenco Marques. Pp. 390–391; 438–439.

Memorie della Societa degli Spettroscopisti Italiani. Catania. Vol 33.

Duner, N. C. Sulla rotazione del sole. P. 13.

Birkeland, Kr. Recherches sur les taches du soleil et leur origine. Pp. 14–18.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

By Mr. H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

Angström, Knut. Intensité de la radiation solaire a différentes altitudes. Recherches faites a Ténériffe 1895 et 1896. (Nova acta soc. sc., Upsala. Ser. 3, Vol. 20, Fasc. 1, 1901.) 46 pp.

Baden. Zentralbureau für Meteorologie und Hydrographie. Niederschlagsbeobachtungen der meteorologischen Stationen im Grossherzogtum Baden, Jahrgang 1904. 2. Halbjahr. 25 pp.

Bates, Henry Walter. The naturalist on the river Amazon. lxxxix, 389 pp.

Buti, Giuseppe. Scritti di fisica e meteorologia. 290 pp.

Christoni, Ciro. Contributo del Leslie e del Belli agli studj attinometrici. (Estratto dagli Atti della Società dei Naturalisti e Matematici di Modena. Serie IV. Vol. III. Anno XXXIV. Modena, 1899.) Pp. 83–94.

Le formole di Bouger per il calcola degli spessori atmosferici e della trasparenza dell'atmosfera. (Estratto dagli Atti della Società dei Naturalisti de Modena. Serie III. Vol. XVI. Anno XXXI. Modena, 1899.) Pp. 165–187.

La fotometria e la pirometria del Lambert rispetto agli studi attinometrici. (Estratto dagli Atti della Società dei Naturalisti e Matematici di Modena. Serie IV. Vol. I. Anno XXXII. Modena, 1899.) Pp. 66–88.

Herschel (John) ed il metodo dinamico nelle misure attinometriche. (Estratto dalle Memorie della Società degli Spettroscopisti Italiani. Vol. 30, 1901.) 9 pp.

Osservazioni meteorologiche fatte negli anni 1899 e 1900 all'Osservatorio Geofisico della R. Università di Modena calcolate dall'Ing. Angelo Manzini. 109 pp.

Parafulmini del R. Osservatorio meteorologico di Sestola. (Pubblicazioni del R. Osservatorio Geofisico di Modena. No. 16.) 12 pp.

Ricerche sperimentali sul coefficiente di induzione dei magneti. 21 pp.

De Saussure e l'attinometria. (Estratto dagli Atti della Società dei Naturalisti e Matematici di Modena. Serie IV. Vol. III. Anno XXXIV. Modena, 1901.) 12 pp.

Sulla legge del raffreddamento di Newton e sulla determinazione della temperatura del sole attribuita al Newton. (Estratto dalle Memorie della Società degli Spettroscopisti Italiani.) Vol. 29, 1901.) 5. pp.

Dobrowolski, A. Expédition Antarcticque Belge. Résultats du voyage du S. Y. Belgica en 1897–1898–1899 sous le commandement de S. de Gerlache de Gomery. Rapports scientifiques publiés aux frais du gouvernment Belge, sous la direction de la Commission de la Belgica. Météorologie. La neige et le givre. 78 pp.

Dubinski, V. Magnetic storm on October 31–November 1. 1903, according to the investigations of the Constantine Observatory in Palovsk. (Reprint from Proceedings of the Imperial Academy of Sciences. Tome XX, No. 2. February, 1904.) Pp. 67–76.

Gautier, R. Résumé météorologique de l'année 1902 pour Genève et le Grand Saint-Bernard. (Tiré des archives des sciences de la bibliothéque universelle. Novembre et décembre 1903.) 108 pp.

Hann, Julius. Lehrbuch der Meteorologie. Lieferung I. Zweite, umgearbeitete Auflage. 96 pp.

Harvard College Astronomical Observatory. Annals of the

Astronomical Observatory of Harvard College. Edward C. Pickering, Director. Vol. LVIII. Part I. Observations and investigations made at the Blue Hill Meteorological Observatory, Massachusetts, U. S. A., under the direction of A. Lawrence Rotch. 62 pp.

The astronomical observatory of Harvard College. 15 pp.

Hongkong Observatory. Observations made at the Hongkong Observatory in the year 1903 by W. Doberck, director. 122 pp.

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International Catalogue of Scientific Literature. Published for the International Council by the Royal Society of London. First and second annual issues.

Austria-Hungary. Kaiserliche Königliche Central-Anstalt für Meteorologie und Geodynamik. Jelinek's Anleitung zur Ausführung meteorologischer Beobachtungen nebst einer Sammlung von Hilfstafeln. In zwei Teilen. Fünfte umgearbeitete Auflage. Hrsg. von der Direktion der k. k. Zentralanstalt für Meteoroligie und Geodynamik. Erster Teil. Anleitung zur Ausführung meteorologischer Beobachtungen an Stationen I. bis IV. Ordnung. ix, 127 pp.

Kaehler, Karl. Ueber die durch Wasserfälle erzeugte Leitfähigkeit der Luft. Inaugural-Dissertation. 34 pp.

Kommission für Luftelektrische Forschungen. Denkschrift der Kommission für Luftelektrische Forschungen nebst Berichten über die Tätigkeit der luftelektrischen Stationen. (Separat-Abdruck aus den Sitzungsberichten der matem.-phys. Klasse der Kgl. Bayer. Akademie der Wissenschaften. Bd. XXXIII 1903 Heft II.)

Lücken, Wilhelm. Die Niederschlagsverhältnisse der Provinz Westfalen und ihrer Umgebung. Mit einer Niederschlagskarte im Masstabe 1; 500,000 sowie 27 Tabellen und 2 Diagrammen. (Sonderabdruck aus dem Jahresbericht 1903 des Westfälischen Provinzial-Vereins für Wissenschaft und Kunst.) 125 pp.

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Nakamura, K. (Coll. and ed.) The climate of Japan. 109 pp.

Oyen, P. A. Meteorologiske iaggttagelser i jotenheimen sommeren 1902. (Archiv for mathematik og naturvidenskab. B. XXV, Nr. 5.) 10 pp.

Pirie, J. H. Harvey and Brown, R. N. Rudmose. The Scottish National Antarctic Expedition. Second Antarctic voyage of the *Scotia*. (Scott. geogr. mag., Edinb. v. 21. pp. 24–37.)

Polluge, Ludwig. Zur Frage der Klimaänderungen und-schwankungen in historischen Zeiten. (Königliches Gymnasium zu Salzwedel. Ostern 1903. II. Wissenschaftliche Beigabe.) 16 pp.

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Quervain, Alfred de. Rapport sur les lancers de ballons-sondes faits en Russie. (Extrait de l'Observatoire de Météorologie Dynamique, T. III, 1903.) 72 pp.

Réthly, Anton. IV. Bericht über die Thätigkeit der kgl. ung. Reichsanstalt für Meteorologie u. Erdmagnetismus und des Observatoriums in O-Gyalla im Jahre 1903. 39 pp.

Reymond, C. La climatologie de Sierre. 32 pp.

Rona, S. and Fraunhoffer, L. Die Temperaturverhältnisse von Ungarn. (Publikationen der königl. ung. Reichsanstalt für Meteorologie und Erdmagnetismus 1904. Band VI.) iii, 155 pp.

Rosenthal, Elmar. Berichtigung zu der Abhandlung "Ueber die elastische Nachwirkung bei Anerold-Barographen." (Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg. 1904. Mars. T. XX, No. 3.) 2 pp.

Ueber die elastische Nachwirkung bei Anerold-Barographen. (Separat-Abdruck aus dem "Bulletin de l'Academie Impèriale des Sciences de St. Petersbourg." V^e serie. Band XIX, No. 3. Oktober, 1903.) Pp. 115–170.

Rudel, —. Grundlagen zur Klimatologie Nürnbergs. Ergebnisse zwanzigjähriger Wetterbeobachtungen zu Nürnberg 1881 bis 1900. I. Teil: Luftwärme. 77 pp. II. Teil: Luftdruck, Wind und Bewölkung. 38 pp.

Rung, G. Répartition de la pression atmosphérique sur l'Europe, observée de 1881 à 1895, et direction moyenne du vent sur les littoraux. 4 tables. 13 charts, 11 by 17 in.

Scheiner, J. A treatise on astronomical spectroscopy, being a translation of die Spectralanalyse der Gestirne by ——. Translated, revised, and enlarged by Edwin Brant Frost. xvii, 482 pp.

Schröder, Rudolf. Ueber die normale Elektrizität der Atmosphäre. (Beilage zum Jahresbericht des Gymnasiums zu Friedenau. Ostern 1903.) 16 pp.

Sieberg, August. Handbuch der Erdbebenkunde. xviii, 362 pp.

Szalay, Ladislaus von. Ueber die Empfindlichkeit der Gewitterapparate. (Sonderabdruck aus der Meteorologische Zeitschrift, 1905, Band XXII.) pp. 10–22.

Weber, Heinrich Die dartiellen Differential-Gleichungen der mathematischen Physik. Nach Riemann's Vorlesungen in vierter Auflage neu bearbeitet von ——. Zwei Bande. xvii, 506; xi, 527 pp.

Webster, A. G. The dynamics of particles and of rigid, elastic, and fluid bodies. xi. 588 pp.

Voeikov, A. J. Meteorology. [Russian text.] In 4 parts. Part I.

UNUSUAL WEATHER AT DODGE, KANS.

BY EUGENE D. EMIGH, Assistant Observer, Dodge, Kans.

Meteorological features of the most unusual characteristics have rendered exceptionally interesting the weather of the two weeks ending February 8, 1905. January 25, 26, and 27 were partly cloudy and pleasant, but throughout the next eight days the sky was entirely obscured, with the exception of two days when the sun shone dimly and for very short intervals.

Rainfall with the temperature below 32° F. is a rare phenomenon, and that rain should be observed at 13° F. seems an almost incredible occurrence, yet one conclusively demonstrated. Light, misting rain began during the night of January 29-30th, with the temperature in the neighborhood of 15° F., and though the highest temperature attained was 24° F. and a minimum of 13° F. occurred, yet precipitation in distinct liquid form was practically continuous for about forty-eight hours, 0.03 inch being recorded. Occasional light flurries of snow mingled with the mist and netted 0.01 inch of water.

Protracted periods of cloudy, unsettled, and stormy weather are not so infrequent as to be considered remarkable in this region; nor is the continuation of severe cold through several days or a week without numerous precedents. It is in the combination of these two conditions that the past week is unique in the 31 winters through which our records extend. Intensely cold weather succeeded the change of precipitation from rain to snow during the night of January 31-February 1. From 7 p. m. of February 1 to 11 a. m. of the 4th, the thermometric column remained below the zero mark, and it was not until Tuesday, the 7th, that no daily minimum temperature below zero, Fahrenheit, was recorded. Eleven degrees below zero on the morning of the 3d was the extreme minimum. Light snow was almost uninterrupted until the morning of the 5th, when a clear day intervened, but the snow resumed its fall on the evening of the 6th and did not finally cease until the morning of the 8th, 2.1 inches being the total snowfall from February 1.

The interesting phenomenon to which Mr. Emigh calls our attention is intimately associated with the southward movement of a most remarkable area of high pressure and low temperature. This appeared in Canada on January 26 and by the morning of Saturday, the 28th, the isotherm of 20° F. had moved westward up the eastern slope, so as to extend continuously from near Barkerville, British Columbia, to Topeka, Kans., and agreed generally with a contour line of about 2000 feet or possibly 2500 feet above sea level. On the morning of the 29th this isotherm was pushed farther west and appeared along the contour line of 6000 feet in Wyoming, and of about 3000 feet west of Dodge. It is very rare that the cold air of the high areas on the eastern slope push up the slope as high as Cheyenne. North and east of Dodge cloudy weather with light snow prevailed on the 28th, 29th, and 30th. But above this cold region of snow, the layer of clouds must have represented a layer of air cooled slowly by radiation so that the fine liquid droplets forming the clouds were subcooled, that is to say cooled far below the temperature of freezing, while still retaining their liquid condition. This is a phenomenon that frequently occurs in nature, and can be easily reproduced in the laboratory. Observers in balloons have frequently recorded the occurrence of such small drops of water, which, on coming in contact

with any solid substance turn to crystals of ice and frost. Even larger raindrops often descend through the cold air and cover the limbs of plants and the ground with a layer of smooth ice, known as Glatteis to German meteorologists. We presume that this was the phenomenon recorded by Mr. Emigh.

If, however, he observed liquid precipitation amounting to 0.03 inches of water in forty-eight hours, and observed this to retain the form of water when measured in the rain gage, although the air temperature and that of the rain gage varied between 24° F. and 13° F., then this certainly is unprecedented.—*C. A.*

STUDIES ON THE DIURNAL PERIODS IN THE LOWER STRATA OF THE ATMOSPHERE.

By Prof. FRANK HAGAR BIGELOW.

I. THE DIURNAL PERIODS OF THE TEMPERATURE.

GENERAL REMARKS.

The following series of papers contains the results of a research into the periodic diurnal processes that take place in the strata of the atmosphere within two miles of the sea-level surface, as disclosed by the data derived from the balloon and kite ascensions made during the past ten years. It includes a discussion of the variations of the temperature, the pressure, the vapor tension, the atmospheric electric potential and coefficient of dissipation of the electric charge, and the diurnal periodic action of the magnetic force. These subjects have been under discussion by meteorologists for many years, but the issue has been so indecisive as to imply that certain important terms have been lacking in the problems, so that it was impossible to come to any definite view regarding the causes and effects in the physical processes. That all these diurnal periods depend upon the effects of the solar radiation in the earth's atmosphere has been evident, but the difficulty of matching together the various lines of experimental evidence derived from observations has been so great that no settled solution has seemed available. The additional data which have been recently secured through observations made in the free air above the ground have, however, altered the point of view in some respects, so that it is believed that the account to be given in these papers describes natural conditions more nearly than has heretofore been possible.

The immediate occasion for undertaking this research consists in the necessity of deciding upon the best lines of work for the Mount Weather Meteorological Observatory, at Bluemont, Va. The organization of so large an institution, dealing with problems in common meteorology, solar radiation, atmospheric electricity and magnetism, made it very important to acquire a clear idea of the relative values of the several types of observation, in order that suitable instruments might be installed and proper observations inaugurated. Since the effects of solar radiation involve many local characteristics which ought to be eliminated before the pure solar terms can be obtained, it was evident that some further knowledge of the diurnal verifications of the several elements should be secured if possible, at least to the extent of reconciling the conflicting evidence that the special lines of research have hitherto produced. It seemed the simplest course to make a study of the data furnished by kite and balloon ascensions, and for this purpose the observations at Berlin,[1] Trappes,[2] Hald,[3] and Blue Hill[4] have been studied.

In this paper our examples will be taken from the Blue Hill data as more applicable to the American meteorological field than the European data can be without special consideration. It should be noted that the Blue Hill Observatory furnished the Weather Bureau with certain temperature observations, made at the Valley Station, which were required in the proposed discussion, and for this courtesy our thanks are expressed.

[1] Wissenschaftlice Luftfahrten, 1888–1898, Berlin.

[2] Veröffentlichungen der Internationalen Kommission für wissenschaftliche Luftschiffahrt, 1901–3

[3] Travaux de la Station Franco–Scandinave de Sondages Aériens à Hald, 1902–3, L. T. de Bort.

[4] Observations at the Blue Hill Observatory, 1901–2, and appendix of the observations with kites 1897–1902, with discussion by H. Helm Clayton.

METHOD OF REDUCING THE OBSERVATIONS.

In Volume XLIII, Part III, Annual Harvard College Observatory, Table III, pages 166–214, the data are given for the temperatures on Blue Hill summit, 195 meters, at various heights, and occasionally at the Valley Station, 15 meters, together with the hour and minute of the observation.

(1) The first step in this discussion was to concentrate this material into smaller proportions by taking the mean values where the kites soared at about the same elevation. This gave a new series of data for the time, height, temperature at that height, and temperature at the summit. Corresponding temperatures for the valley at these times were extracted from the observatory records, at the request of the Weather Bureau, so that it became possible to refer the temperature-falls practically to the sea level. It was feared that any characteristic effects of the Blue Hill itself upon the diurnal temperatures, by means of radiation or by convection currents, might prevent the computed temperatures at higher elevations from bringing out the law in the free air with sufficient purity.

(2) A computation of the temperature-fall was next made for each time of observation by taking the difference between the temperature at the height and the valley temperature. A discussion of these temperature differences was preferred, in order finally to obtain the mean temperature at certain selected levels for each hour in the day, rather than to mass together the actual temperature readings recorded at these levels. In the former case the numerical values are less scattering than in the latter, and therefore they are more easily reduced to mean values. If the actual temperatures of the air, in the successive masses associated with the progress of high or low areas over a given station, are employed as the basis of computation, a very large number of observations are required to produce correct normal values in the several strata. The mean temperature falls, on the other hand, added to the normal values at the Valley Station, give the same result theoretically, and this can be obtained much more exactly for a limited number of observations by the method of differences.

(3) The first collection of the temperature differences contained the data applicable by simple interpolation to the levels 15, 195, 400, 600, ... 3800, 4000 meters, or as high as the ascension made its record. The data from the several years, 1897-1902, were collected by months, so that for example all of the January temperature-falls were brought together. They were also arranged by cyclonic and anticyclonic areas, so as to distinguish between the cold southward-directed current and the warm northward-directed current. The former covers generally the areas lying between the centers of the high and low to the eastward of the high, with winds from the northern quadrants, and the latter includes the areas between the centers of the low and high to the eastward of the low, with winds from the southern quadrants. Referring to the subareas adopted in my Cloud Report, chart 9, page 139, they were arranged in the following scheme, marked for convenience H. I=N.W., L. II=N.E., for southward, L. III=S.W., H. IV=S.E., for northward. The subarea for Blue Hill on the date of observation was scaled from the Weather Bureau daily weather maps.

The purpose of this collection was to discover to what extent the diurnal temperature-falls and corresponding gradients in the free air depend upon the cyclonic circulation, that is whether the temperature-fall is different over the cold currents from the north to that over the warm currents from the

south. It may be stated in anticipation of the result that no important difference could be determined from these observations.

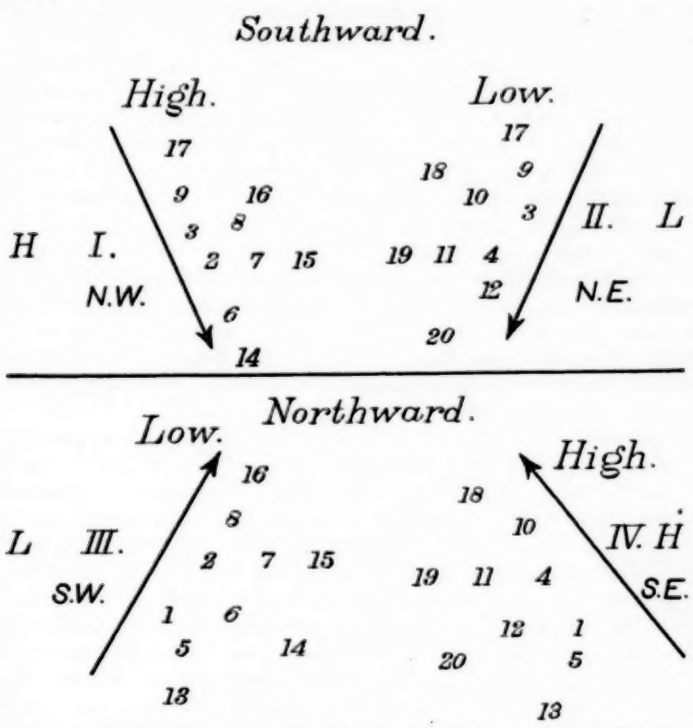


FIG. 1.—Adopted subareas for collecting the temperature data.

(4) In the next collection of the temperature-falls the northward data was kept separate from the southward data, both being computed independently. A further concentration was effected by interpolating the data to the values occurring at the hours 12 m., 1, 2.....12 p. m., 1,..... 12 m., for each ascension, and bringing together all the data occurring at the same hour of the day, and as before for each month in the year at the adopted 200-meter intervals. These tables give the respective differences of temperature at each hour of the day, at the heights adopted, in warm and cold currents, and for each month in the year. From this point onward it was necessary to resort to a graphic construction to obtain average values, because the data were not sufficiently abundant at all hours of the day, in each month, for so many levels, to make the result reliable. There may be some question as to the definitive values of the results on this account, but as it was our purpose to obtain a provisional idea of the atmospheric conditions, for the purpose of planning further observations at Mount Weather, we were justified in making as much as possible out of the data in hand.

(5) The individual values of the temperature-fall for each elevation adopted were plotted on sheets, keeping each month separate, so arranged that the ordinates are the differences of temperature between that observed at the Valley Station and the temperature recorded by the thermograph attatched to the kite, the abscissas being the hours of the day beginning at midnight. The data belonging to the southward-directed, or cold currents, were plotted in black and the northward, or warm currents, in red, so that by inspection any systematic difference between these two types could be seen. It may be stated that *no notable divergence between the temperature-falls over the warm and cold currents could be detected*, and we conclude that the warm and cold masses resting on the ground, on either side of the cyclone center, fall off by about the same gradients up to at least one mile, and probably to two miles, in elevation. These masses of air, therefore, preserve their relative independence in the lower strata of the atmosphere, whatever changes may occur in their mechanical structure when penetrating the eastward drift of the higher levels. At the Valley Station itself the actual temperatures were plotted in the same way that temperature-falls were plotted for the several levels lying above it. Mean lines were now drawn through these several groups, or points, to represent as nearly as possible the average values. There was little difficulty in doing this accurately for the hours 10 a. m. to 8 p. m., where data were abundant, but for the remaining hours of the day there was more uncertainty, especially in the winter months, when the number of ascensions was not great. In the levels 195, 400, 600, 800 and 1000 meters, it was possible to construct fairly reliable mean curves, but since the scattering increases rapidly above the 1000-meter level, it was not possible to proceed directly by this method above the 1400-meter level.

(6) In order further to control these average curves and insure an accuracy even greater than could be obtained by simple estimation of the mean position of the curves, the following process was employed. For the hours 12 a. m., 4 a. m., 8 a. m., 12 p. m. 4 p. m., and 8 p. m., the values lying on these curves for the respective hours were transposed to another set of sheets, where the ordinates are the temperature-falls, and the abscissas the month in the year. Thus a rough locus was formed for 12 a. m. or midnight, so that the varying value at that hour for each month in the year might be seen. A curve was then drawn through these points, smoothing down the irregularities, on the theory that the temperature variation constructs a comparatively regular curve in the course of the year. This procedure doubtless tended to fix six points on the diurnal curve at each level with considerable accuracy, and these adjusted points were now transferred back into the preceding set of curves originally derived from the individual observations. The passage from month to month in the way indicated, allowed us to bridge over many gaps in the kite record that could not otherwise have been done. The first set of curves was now readjusted in conformity with these guiding points at 4-hour intervals. The adjustment of fragmentary records by continuous curves crossing each other in two directions as in this case, nearly at right angles, is not only expeditious but usually brings out results very close to the truth, because the mutual adjustment of neighboring points in two directions eliminates the merely accidental errors due to short and imperfect records. This is especially true if some of the fixed points are well established as in these observations during the afternoon hours of the warm months of the year.

(7) For the prosecution of this discussion whose object it was to eliminate the special local conditions pertaining to the Blue Hill summit, it was necessary to secure accurate normal values of the temperature at each hour of the day, and for each month of the year, at the Valley Station. As these data were not in hand at the Blue Hill Observatory we proceeded as follows:

As stated above the normal diurnal curves for the Valley Station were computed from the data supplied to the Weather Bureau at the times the kites were flying. Also, the normal diurnal temperatures for the summit were supplied from the records of twenty years 1885-1904, which were accurate. By the computations above described for the temperature differences between the summit and valley, inasmuch as the amount of data was sufficient, we had reliable corrections which applied to the summit normal temperatures for each hour gave the corresponding values at the Valley Station. These were compared with the diurnal values obtained on the days of kite ascensions, and from their combination certain surface temperatures were found upon which the temperatures computed in higher strata were made to depend. Any inaccuracies pertaining to the final results derived in this manner can be eliminated by further direct observations, but it will require a

very large number of additional ascensions to accomplish any such purpose.

(8) We can impose upon this data yet another mutual adjustment. Up to this point the several curves for each month have been kept entirely independent of one another up to 1400 meters, but they were now brought together on sheets, one for each month, by transferring the several curves to the same set of axes of ordinates and abscissas. The successive curves in elevation now took positions appertaining to their respective temperatures differences. This can be seen by inspecting the curves of figs. 2–13, "Temperature-falls in the the lower strata, Blue Hill kite observations 1897-1902." In the lower levels 195, 400, 600, 800 and 1000 meters, there is great divergence in the shape of the curves, but they gradually approach a typical form which must be eventually that of the temperature curve at the surface itself. This is evident from the fact that at some elevation the diurnal variation proper of the temperature ceases to be effective, and since the temperature-falls were measured from the surface curve, the same curve must appear at those levels which have no true diurnal variation of their own. The difference between the surface curve and the computed curve at any given elevation gives the variation belonging to that level. The elevation at which the diurnal variation really disappears for each month in the year was not known, and could not be determined from the observations. It must be lower in winter than in summer, and I have merely assumed an average of 3400 meters. In case this is not correct, it yet is evident from the formation of these curves up to 1400 or 1600 meters that it has become a comparatively small quantity and that a change in the elevation from 3400 meters will have little effect upon the conclusions which we required in this series of papers, since they pertain to the strata up to only 2000 meters.

(9) The kite ascensions in several cases extended up to 3000 or even to 4000 meters, and by studying the computed table of temperature-falls it was not difficult to select the temperature-fall applicable at the 3400-meter level for each month. These were plotted in an annual curve, and the smoothed values were adopted for further use. At the value determined in this way for 12 m., or midday, as the temperature-fall for the month, the mean diurnal temperature curve of the Valley Station was plotted, and it is seen as the uppermost curve of the system marked 3400. We had already carried the other set of curves up to 1400 meters, and it was proper to suppose that the gradient system changed by regular steps between these two elevations. A study of these curves from month to month will, I believe, lead to the conviction that they are a very close approximation to the mean temperature-fall system in the lower strata which would be derived from a very long series of ascensions.

RESULTS OF THE DISCUSSION.

The system of curves, figs. 14–25, "Temperature-falls in the lower strata, Blue Hill kite observations, 1897–1902," contain the final results of this discussion. The chief point of criticism, as already mentioned, is the adopted height, 3400 meters, at which the surface curve should be located. The interpolation between this curve and the 1400-meter curve will be a little different if the topmost curve should preferably be placed at an elevation lower or higher than the one adopted, which is about two miles above the summit of Blue Hill. The most conspicuous feature of these curves in each month is the relative forms of the curves at 195, 400, 600, and 800 meters, which indicate that the temperature-falls are very different in the successive lower levels. By taking the differences between any two curves of the system the mean temperature gradient can be readily computed. Another striking characteristic is the persistent inversion of temperatures in the hours from 10 p. m. to 5 a. m., especially in the lower levels up to 1000 meters. This is seen by the ordinates being drawn with a positive sign, or downward on this scale of ordinates. The midday maximum temperature-fall can be seen to occur at an earlier hour in the lower levels, as 12 m. to 1 p. m., and at a later hour in the higher levels, as 2 to 4 p. m. The maximum rate of variation is quite uniformly located in the morning hours at 6 to 10 a. m. for rising temperature and at 5 to 9 p. m. for falling temperature. An examination of the curves from month to month shows that there is a general increase in the amplitude from winter to summer. At the same time, in the winter months the amplitude for the lower levels, 600 to 1000 meters, is greater than for the upper levels; on the other hand, in summer the amplitude in the lower levels is less than in the higher levels. The transition months, April, May and September, October, have about equal amplitudes in each level. The fact that this subtle law has been deduced by the method of computation employed speaks strongly for the efficiency of cross-plotted adjustments.

I have used the same method in deducing the temperatures of the atmosphere up to 16,000 meters, charts 78, 79, International Cloud Report, and in determining the temperatures under the Rocky Mountain Plateau at sea level, chart 13, Barometry Report, and in other places. It is the only satisfactory way to adjust broken series of incomplete data to an approximate mean, such as can be secured otherwise only by a very great number of direct observations. Several other important relations will be found in the other papers of this series which tend to confirm these conclusions. It may also be further noted that there seems to be a semiannual period in the positive or the inversion ordinates in the morning hours 2 to 5 a. m., as well as a rearrangement in the order of heights at which this is greatest. Thus, the amplitude for the 4 a. m. hour of the 400-meter curve has a single period, with maximum in February and minimum in October; the 600-meter curve, however, has a maximum in February and another maximum in June, with minima in April and October; the 800-meter curve has two maxima and two minima in agreement with the 600-meter curve. The 195-meter curve at the summit of Blue Hill shows that the temperatures at the summit and base, 15 meters, do not vary in parallel, and hence the gradient system referred to the level of the open country will differ somewhat from that referred to the summit. This should be remembered in the use of the gradients of the Blue Hill Observatory Report.

We have now obtained the material necessary for deducing the mean (approximate) temperatures at the different levels, by merely adding algebraically the temperature-falls to the normal temperatures of the Valley Station. The results are given in the tables, figs. 14–25, "Blue Hill temperatures in the lower strata." The ordinates of temperature have been plotted to decrease upward, in order that they may conform to the actual conditions in the free air, where the temperature diminishes generally with the height. There are several results of unusual interest to meteorology which appear on the face of these charts. The first is the remarkable distribution of temperature in the levels from 600 meters upward as compared with the surface temperatures. In the winter months—December to March, inclusive—there is a pronounced inversion of temperature throughout the day, so that the night hours, 7 p. m. to 5 a. m., are warmer, while the day hours, 6 a. m. to 6 p. m., are colder than the mean for the day at the several levels. It seems very remarkable that in the hours of full sunshine the effect of the radiation on the temperature of a stratum of air should be to allow it to remain cool rather than to heat it. Evidently the result comes about indirectly, by reason of the fact that the incoming short-wave radiation has little influence directly on the temperature, because there is not much absorption. These short waves impinge upon the surface of the earth, which becomes a radiating body of low

temperature and emits long waves. These are strongly absorbed according to the prevailing physical conditions, as the relative amounts of dry air and aqueous vapor, coefficients of absorption for different wave lengths, and so on. Convection currents also enter into the result, and, indeed, the complex function here displayed requires much careful examination before further conclusions can be stated. The temperatures diminish generally with the height after leaving the 400-meter level, but the diurnal period gives a maximum of cold at midday and a minimum about midnight. In the summer months, on the other hand—June, July, August—the inverted temperature distribution does not exist relatively to the surface, but the curves are all of the same general type, with a maximum temperature in the late afternoon, and minimum in the early morning. In the transition months—April, May, September, October, November—the diurnal temperature curve has two maxima, 8 a. m. and 8 p. m., and two minima, 2 a. m. and 2 p. m. The process of transition can be followed in the several levels from month to month, and it is a very interesting phenomenon.

The second important feature of these curves is the building of a semidiurnal period in the temperature at the elevation 400 to 600 meters, in all months in the year, with the maxima at 8 to 9 a. m. and 9 to 10 p. m. They are seen very distinctly represented in May and September, where they are formed up to the very top of the diurnal disturbance. The single diurnal period at the surface is replaced by a double diurnal wave at 400 meters, and this appears quite plainly in every month except July, where it probably is nearly extinct. In the higher levels, above 800 meters, there is a tendency for the double periods to contract the maxima from the 9 a. m., 9 p. m. hours nearer toward midday, and form two crests or a single crest near midday, especially in the winter months. It will be shown in the next paper of this series that those superposed temperature waves, having their maxima disposed as just explained, are competent to produce the diurnal variation of the barometric pressure in the single, double, and triple components, into which the observed pressure at the surface is usually resolved by the Fourier Series of Harmonics. Mr. Clayton has obtained similar curves of temperature at 500, 1000, 1500 meters, as shown on fig. 5 of his paper on "The diurnal and annual periods of temperature."—Annual Harvard College Observatory, Vol. LVIII, Part I, 1904, though they are composites of the several curves really belonging to different months of the year. It will be seen from our curves that mean annual values computed from observations taken in all parts of the year are correct only for certain limited intervals, in which the varying temperatures pass through such special values. Similarly, all discussion of data depending upon mean values made up in this way can have only a limited application in deducing daily free air temperatures throughout the year. This disclosure of the fact that the temperature curves differ according to the elevation from the one observed at the surface opens up the possibility of explaning not only the semidiurnal and triple diurnal barometric waves, but also the movements of the ions in the atmosphere in their relation to the electric potential gradient, the coefficient of neutralization and number of ions, in the connection with other meteorological phenomena, and the variations of the diurnal magnetic field in all latitudes of the earth. These researches will be explained in the other papers of the series.

MATHEMATICAL THEORY OF ICE FORMATION.

By S. TETSU TAMURA.

It is well known to the mathematical physicist that the first to give the most complete mathematical theory of heat conduction was Joseph Fourier, who belonged to the constellation of the most brilliant men of science in the time of Napoleon Bonaparte. The entire subject of heat conduction was created by Fourier's "Théorie Analytique de la Chaleur", and all its later experimental developments have been suggested, or rendered possible, by this immortal work. Side by side with La Place's and Poisson's Equations, Green's Theorem, and Lagrange's Equation, Fourier's Theory, or the analysis known to mathematicians as Fourier's Method, has played a wonderful rôle in the whole domain of mathematical and experimental physics. Lord Kelvin once said that Fourier's work is one of the greatest contributions to the nineteenth century. "Fourier's exquisitely original methods," said the late Professor Tait, "have been the source of inspiration of some of the greatest mathematicians, and the mere application of one of its simplest portions to the conduction of electricity has made the name of Ohm famous".

Among those problems which afford us examples of the application of Fourier's beautiful analysis, there are two groups of the geophysical questions which are extremely important, as well as absorbingly interesting. To the first group belong the problem of the distribution of the earth's internal heat and its consequent effect upon the temperature near the earth's surface, and the problem of the penetration of the sun's heat into the crust of the earth. These problems of widely general and of peculiar mathematical interest were first attacked by Fourier himself and Poisson, the greatest contemporary of Lagrange, and La Place. Some forty years ago, Lord Kelvin startled geologists by telling them that Fourier's Theory forbids such long intervals of time as they were in the habit of assigning to the aggregate of paleontological phenomena. The problems of the second group are rather of smaller feature, but none the less beautiful and interesting as the applications of Fourier's analysis. They are problems of ice formation, especially in the polar sea, and of the penetration of frosts into the ground. These questions, with whose discussion we are now concerned, seem to have been attacked by very few scientists, notably by Franz Neumann who was an eminent mathematical physicist of his day, and Julius Stefan, the famous physicist. Neumann's analysis[1] appears in Riemann-Weber's Partielle Differentialgleichungen der Mathematischen Physik, Bd. II, § 49, and Stefan's memoir[2], "Ueber die Theorie der Eisbildung, insbesondere über die Eisbildung in Polarmeere" in Wied. Ann. Bd. XLII.

Suppose that the surface of a mass of water is in contact with another surface whose temperature is θ_0. θ_0 may be either constant or variable; but it must be always below freezing. Under this surface there will be formed a layer of ice, whose thickness, ε, is a function of the time, t. The temperature, θ, of the mass of ice is itself a function of the time, t, and of the distance, x, from the surface.

Let

θ_1 = temperature in ice.
θ_2 = temperature in water.
k_1 = conductivity of ice.
k_2 = conductivity of water.
ρ_1 = density of ice.
ρ_2 = density of water.
c_1 = specific heat of ice.
c_2 = specific heat of water.
} Assumed as constant.
$a_1^2 = \dfrac{k_1}{c_1\rho_1}$ = diffusivity of ice.
$a_2^2 = \dfrac{k_2}{c_2\rho_2}$ = diffusivity of water.

Then the following equations hold:

$$\frac{\partial\theta_1}{\partial t} = a_1^2\frac{\partial^2\theta_1}{\partial x^2} \text{ in ice, or for } 0 < x < \varepsilon.$$
$$\frac{\partial\theta_2}{\partial t} = a_2^2\frac{\partial^2\theta_2}{\partial x^2} \text{ in water, or for } \varepsilon < x. \qquad (1)$$

[1] Also in Wien. Ahad. Sitz. ber. Bd. 98, Abth, II a.
[2] The title, "Vordringen des Frosts."

The temperature of the boundary surface of ice and water (at $x=\varepsilon$) will be always equal to 0° C, and there will be new ice formed continually. If ε is added by $d\varepsilon$ in the time dt, the quantity of heat set free thereby is

$$\lambda \rho_1 d\varepsilon$$

where λ represents the latent heat of fusion of ice and ρ_1 its density. The quantity of heat that flows outward through the unit area of the lowest sheet of ice is given by

$$-k_1\left(\frac{\partial\theta_1}{\partial x}\right)_{x=\varepsilon} dt$$

and at the same time the quantity of heat that flows to the boundary surface upward from the water is

$$k_2\left(\frac{\partial\theta_2}{\partial x}\right)_{x=\varepsilon} dt$$

Hence we obtain the following double surface condition:

$$\left(k_1\frac{\partial\theta_1}{\partial x}-k_2\frac{\partial\theta_2}{\partial x}\right)_{x=\varepsilon}=\lambda\rho_1\frac{\partial\varepsilon}{\partial t} \qquad (2)$$

and the other conditions are

$$\theta_1=\theta_0 \quad \text{for } x=0 \qquad (3)$$
$$\theta_1=\theta_2=0 \quad \text{for } x=\varepsilon \qquad (4)$$
also $$\theta_2=\theta_1 \quad \text{for } x=\delta \qquad (5)$$
where $$\delta>\varepsilon$$

Lastly, if $t=0$, θ_1 for $0<x<\varepsilon$ and θ_2 for $\varepsilon<x<\delta$ may be considered as functions of x.

Now our task will be to solve the two principal equations (1), subjected to the conditions (2), (3), (4), (5); but their general solution has not yet been worked out. The condition (2) contains some unknown function ε, which is not linear, and we have not been able to build up a general solution by summing up a number of particular solutions. Franz Neumann, however, gave in his lectures[3] at Königsberg a solution of our equations under the conditions (2), (3), (4) and

$$\theta_2=\theta_1 \text{ for } x=\infty \qquad (6)$$

instead of (5).

To begin with, let us work out the general solution of the equation for heat condition,

$$\frac{\partial\theta}{\partial t}=a^2\frac{\partial^2\theta}{\partial x^2} \qquad (7)$$

under the conditions

$$\theta=0 \text{ for } x=0 \qquad (8)$$
$$\theta=f(x) \text{ for } t=0. \qquad (9)$$

It is easily seen that

$$\theta=e^{-a^2\alpha^2 t}\sin \alpha x \qquad [\alpha \text{ being wholly unrestricted}]$$

satisfies the equation (7) and the conditions (8) and (9). Therefore it is one of our particular solutions. From this we can build up by Fouriers' theorem[4] the following expression:—

$$f(x)=\frac{2}{\pi}\int_0^\infty d\alpha\int_0^\infty f(\lambda)\sin\alpha x\sin\alpha\lambda\, d\lambda$$

and therefore we have

$$\theta=\frac{2}{\pi}\int_0^\infty d\alpha\int_0^\infty e^{-\alpha^2\alpha^2 t} f(\lambda)\sin\alpha x\sin\alpha\lambda\, d\lambda \qquad (10)$$

as our required solution; for $\theta=0$, when $x=0$

$$\theta=f(x)=\frac{2}{\pi}\int_0^\infty d\alpha\int_0^\infty f(\lambda)\sin\alpha x\sin\alpha\lambda\, d\lambda, \text{ when } t=0.$$

Now[5]

$$\int_0^\infty e^{-a^2x^2}\cos bx\,dx=\frac{\sqrt{\pi}}{2a}e^{-\frac{b^2}{4a^2}}.$$

[3] Riemann—Weber, Partielle Differentialgleichungen, Bd. II, § 49.
[4] Riemann—Weber, Bd. I, § 17. Byerly's Fourier's Series, Art. 32.
[5] Byerly's Int. Cal., Art. 94 (2).

Therefore (10) becomes

$$\theta=\frac{1}{2a\sqrt{\pi t}}\int_0^\infty f(\lambda)\left(e^{-\frac{(\lambda-x)^2}{4a^2t}}-e^{-\frac{(\lambda+x)^2}{4a^2t}}\right)d\lambda \qquad (11)$$

or, if we put

$$\beta=\frac{\lambda-x}{2a\sqrt{t}} \text{ or } \lambda=x+2a\sqrt{t}\,\beta,$$

(11) may be reduced to the form

$$\theta=\frac{1}{\sqrt{\pi}}\left[\int_{-\frac{x}{2a\sqrt{t}}}^\infty e^{-\beta^2} f(x+2a\sqrt{t}\,\beta)d\beta - \int_{\frac{x}{2a\sqrt{t}}}^\infty e^{-\beta^2} f(-x+2a\sqrt{t}\,\beta)d\beta\right] \qquad (12)^6$$

If the initial temperature be constant and equal to θ_0, or

$$\theta=f(x)=\theta_0 \text{ for } t=0, \qquad (13)$$

the expression (12) is reduced to

$$\theta=\frac{\theta_0}{\pi}\left[\int_{\frac{x}{2a\sqrt{t}}}^\infty e^{-\beta^2}d\beta-\int_{-\frac{x}{2a\sqrt{t}}}^\infty e^{-\beta^2}d\beta\right]$$
$$=\frac{2\theta_0}{\pi}\int_0^{\frac{x}{2a\sqrt{t}}} e^{-\beta^2}d\beta. \qquad (14)$$

If we suppose that

$$\theta(x)=\frac{2}{\sqrt{\pi}}\int_0^x e^{-\beta^2}d\beta, \qquad (15)^7$$

then for $x=0$,

$$\theta(0)=0,$$

for $x=\infty$,

$$\theta(\infty)=\frac{2}{\sqrt{\pi}}\int_0^\infty e^{-\beta^2}d\beta=\frac{2}{\sqrt{\pi}}\times\frac{\sqrt{\pi}}{2}=1,$$

and for the negative value of x,

$$\theta(-x)=\frac{2}{\sqrt{\pi}}\int_0^{-x} e^{-\beta^2}d\beta=-\frac{2}{\sqrt{\pi}}\int_0^x e^{-\beta^2}d\beta$$

whence

$$\theta(-x)=-\theta(x).$$

As $$e^{-\beta^2}=1-\frac{\beta^2}{1!}+\frac{\beta^4}{4!}-\frac{\beta^6}{6!}+\cdots\cdots$$

$$\theta(x)=\frac{2}{\sqrt{\pi}}\int_0^x e^{-\beta^2}d\beta$$
$$=\frac{2}{\pi}\left(\beta-\frac{\beta^3}{3.1!}+\frac{\beta^5}{5.2!}\cdots\cdots\right)$$
$$=\frac{2}{\pi}\sum_{\nu=0}^{\nu=\infty}\frac{(-1)^\nu x^{2\nu+1}}{\nu!\,(2\nu+1)}.$$

Therefore $$\theta=\frac{2\theta_0}{\pi}\int_0^{\frac{x}{2a\sqrt{t}}} e^{-\beta^2}d\beta$$

$$=\theta_0\theta\left(\frac{x}{2a\sqrt{t}}\right) \qquad (16)$$

or when expanded,

$$\theta=\frac{2\theta_0}{\pi}\left(\frac{x}{2a\sqrt{t}}-\frac{x^3}{3(2a\sqrt{t})^3}+\frac{x^5}{5.2!(2a\sqrt{t})^5}\cdots\right)$$

[6] Byerly's Fourier's Series, Art. 50. Weber-Riemann, Bd. II, pp. 36 and 37.
[7] Weber-Riemann, Bd. I, §. 26.

$$= \frac{2\theta_0}{\pi} \sum_{\nu=0}^{\nu=\infty} \frac{(-1)^\nu \left(\frac{x}{2a\sqrt{t}}\right)^{\nu+1}}{\nu!(2\nu+1)}.$$

Thus we can easily see that $\theta\left(\frac{x}{2a\sqrt{t}}\right)$ satisfies our principal equations (1). If A_1, B_1, A_2, B_2, are constant,

$$\theta_1 = A_1 + B_1\theta\left(\frac{x}{2a_1\sqrt{t}}\right)$$
$$\theta_2 = A_2 + B_2\theta\left(\frac{x}{2a_2\sqrt{t}}\right) \quad (17)$$

must also satisfy our equations.

$$\theta\left(\frac{x}{2a\sqrt{t}}\right) = 0 \text{ for } x = 0$$
$$\theta\left(\frac{x}{2a\sqrt{t}}\right) = 1 \text{ for } x = \infty$$

$\theta\left(\frac{x}{2a\sqrt{t}}\right)$ becomes constant also, if x is proportional to $\sqrt{t}$ or if $\varepsilon = b\sqrt{t}$ when $x = \varepsilon$. (18)

In order that the solutions (17) satisfy (2), (3), (4), and (6), we must have

$$A_1 = \theta_s$$
$$A_1 + B_1\theta\left(\frac{b}{2a_1}\right) = 0$$
$$A_2 + B_2\theta\left(\frac{b}{2a_2}\right) = 0 \quad (19)$$
$$A_2 + B_2 = \theta_1.$$
$$\frac{k_1 B_1}{a_1\sqrt{\pi t}} e^{-\frac{b^2}{4a_1^2}} - \frac{k_2 B_2}{a_2\sqrt{\pi t}} e^{-\frac{b^2}{4a_2^2}} = \frac{\lambda\rho_1 b}{2\sqrt{t}}.$$

From (19) we have

$$B_1 = \frac{\theta_s}{\theta\left(\frac{b}{2a_1}\right)} \qquad B_2 = \frac{\theta_1}{1 - \theta\left(\frac{b}{2a_2}\right)}$$

whence

$$\frac{k_1\theta_s e^{-\frac{b^2}{4a_1^2}}}{a_1\theta\left(\frac{b}{2a_1}\right)} + \frac{k_2\theta_1 e^{-\frac{b^2}{4a_2^2}}}{a_2\left[1-\theta\left(\frac{b}{2a_2}\right)\right]} = -\frac{\lambda\rho_1 b\sqrt{\pi}}{2}. \quad (20)$$

From this last transcendental equation we may be able to find the constant b or $\frac{\varepsilon}{\sqrt{t}}$. Since $\varepsilon = b\sqrt{t}$, it follows that the thickness of ice increases in direct proportion to the square root of the time, and also it follows that the formation of ice is slow with the increase of depth.

If b is found, A_1, A_2, B_1, and B_2, which appear in (17), may be easily found from (19).

If we take θ_s positive and θ_1 negative, the formulæ represent the laws of fusion of ice.

It must not, however, be forgotten that the whole analysis, however elegant it may be, has been based upon many objectionable assumptions. In the first place, the change of the density of water when frozen into ice was entirely neglected in the analysis. The assumptions

$$\theta_1 = \theta_s \text{ (constant) for } x = 0$$
$$\theta_2 = \theta_1 \text{ (constant) for } x = \infty$$

are another objectionable feature. Lastly, it must be remembered that the solutions are merely particular solutions of our equations.

Julius Stefan simplified the problem by the assumption that the temperature of water below the boundary surface of ice and water is everywhere and always equal to zero. Our equations and boundary conditions (1), (2), (3), (4), (5) then become

$$\frac{\partial\theta_1}{\partial t} = a_1^2\frac{\partial^2\theta_1}{\partial x^2} \text{ for } 0 < x < \varepsilon. \quad (21)$$
$$k_1\left[\frac{\partial\theta_1}{\partial x}\right]_{x=\varepsilon} = \lambda\rho_1\frac{d\varepsilon}{dt} \quad (22)$$
$$\theta_1 = -\theta_s \text{ for } x = 0 \quad (23)$$
$$\theta_1 = 0 \text{ for } x = \varepsilon \quad (24)$$

As θ_1 is a function of the time and place,

$$d\theta_1 = \frac{\partial\theta_1}{\partial x}dx + \frac{\partial\theta_1}{\partial t}dt$$

when $x = \varepsilon$, $\theta = 0$, whence

$$\frac{\partial\theta_1}{\partial t} + \left(\frac{\partial\theta_1}{\partial x}\right)_{x=\varepsilon}\frac{d\varepsilon}{dt} = 0$$
$$\frac{\partial\theta_1}{\partial t} = -\frac{a_1^2 c_1}{\lambda}\left(\frac{\partial\theta_1}{\partial x}\right)^2_{x=\varepsilon} \quad (25)$$

It is easily seen that if $\xi = \varepsilon - x$, then the expression[8]

$$-\frac{c\theta_1}{\lambda} = \frac{1}{2!}\frac{d\xi^2}{a_1^2 dt} + \frac{1}{4!}\frac{d^2\xi^4}{a_1^4 dt^2} + \cdots\cdots \quad (26)$$

satisfies (21) and the condition $\theta_1 = 0$ for $x = \varepsilon$.

Let us differentiate this expression with respect to x and then we obtain

$$-\frac{c}{\varkappa}\frac{\partial\theta_1}{\partial x} = -\frac{1}{1!}\frac{d\xi}{a^2 dt} - \frac{1}{3!}\frac{d^2\xi^2}{a^2 dt^2} \cdots\cdots$$

When $x = \varepsilon$, this satisfies (24).

Since $\theta_1 = -\theta_s$ for $x = 0$, it follows that

$$\frac{c\theta_s}{\lambda} = \frac{1}{2!}\frac{d\varepsilon^2}{a^2 dt} + \frac{1}{4!}\frac{d^2\varepsilon^4}{a^4 dt^2} + \cdots\cdots \quad (27)$$

If the thickness of the layer of ice ε is given as a function of time t, then θ_s may be easily determined; but, if θ_s is given, it is in general difficult to determine ε.

Now, if we suppose that the temperature θ_s of the upper surface is constant, the right side of the expression (27) must be constant. This condition is fulfilled, if the thickness of ice increases in proportion to the square root of the time, or

$$\varepsilon^2 = 2p^2a^2t \quad (28)$$

where p is constant. Then from (27) we have

$$\frac{c\theta_s}{\lambda} = \frac{p^2}{1} + \frac{p^4}{1\cdot3} + \frac{p^6}{1\cdot3\cdot5} + \cdots\cdots \quad (29)$$

For the first approximation

$$\frac{c\theta_s}{\lambda} = p^2 = \frac{\varepsilon^2}{2a^2t} \quad (30)$$

whence

$$\varepsilon^2 = \frac{2ca^2\theta_s t}{\lambda}. \quad (31)$$

For the second approximation

$$\frac{c\theta_s}{\lambda} = p^2 + \frac{p^4}{3} \text{ or } \frac{1}{3}p^4 + p^2 - \frac{c\theta_s}{\lambda} = 0$$

$$p^2 = \frac{-1 \pm \sqrt{1 + \frac{4}{3}\frac{c\theta_s}{\lambda}}}{\frac{2}{3}} = +\frac{3}{2}\left(\sqrt{1 + \frac{4c\theta_s}{3\lambda}} - 1\right)$$

$$\varepsilon^2 = 3a^2t\left(\sqrt{1 + \frac{4c\theta_s}{3\lambda}} - 1\right). \quad (32)$$

The above formulæ may be obtained by the following method:

The expression

[8] Stefan's "Ueber die Theorie der Eisbildung." Wied Ann. Bd. XVII

$$\theta_1 = A\int_{\frac{x}{2a\sqrt{t}}}^{\frac{p}{\sqrt{2}}} e^{-\beta^2} d\beta \qquad (33)$$

in which A and p are constants, satisfies the equation (21).

If $x = 0$, θ_1 will take a constant value.

$$\theta_s = A\int_0^{\frac{p}{\sqrt{2}}} e^{-\beta^2}\, d\beta, \qquad (34)$$

which is the expression for the temperature of the upper surface.

From (33)

$$\theta_1 = 0_1 \text{ when } \frac{x}{2a\sqrt{t}} = \frac{p}{\sqrt{2}},$$

and by (24) $\theta_1 = 0$, when $x = \varepsilon$,

whence $$\frac{\varepsilon}{2a\sqrt{t}} = \frac{p}{\sqrt{2}},$$

or, as expressed in (28), $\varepsilon^2 = 2p^2x2t.$ (28)

By (25) we can determine the value of p. Let us differentiate θ_1 in (33) with respect to x and t. Then we have

$$\frac{\partial\theta_1}{\partial t} = A\, e^{-\frac{x^2}{4a^2t}} \frac{x}{2at\sqrt{t}}.$$

$$\frac{\partial\theta_1}{\partial x} = -A\, e^{-\frac{x^2}{4a^2t}} \frac{1}{2a\sqrt{t}}.$$

Introducing these expressions into (25), we obtain

$$A\, e^{-\frac{p^2}{2}} \frac{p}{2\sqrt{2}\,t} = \frac{a^2c}{\lambda} A^2 e^{-p^2} \frac{1}{4a^2t}.$$

With (34)

$$\frac{p}{\sqrt{2}}\, e^{\frac{p^2}{2}} \int_0^{\frac{p}{\sqrt{2}}} e^{-\beta^2}\, d\beta = \frac{c\theta_s}{2\lambda}, \qquad (35)$$

which serves for the determination of p. By expanding (35), we reach the formula (29)

$$\frac{c\theta_s}{\lambda} = \frac{p^2}{1} + \frac{p^4}{1\cdot3} + \frac{p^6}{1\cdot3\cdot5} + \ldots\ldots \qquad (29)$$

and, as before shown,

$$p^2 = \frac{c\theta_s}{\lambda} \text{ or } p = \sqrt{\frac{c\theta_s}{\lambda}}, \qquad (30)$$

$$\varepsilon^2 = \frac{2ca^2\theta_s t}{\lambda}, \qquad (31)$$

etc., etc.

All these formula hold only when θ_s is constant.

Another particular solution which may be made to satisfy (21) and (25) is

$$\theta_1 = \frac{A}{a}\left(e^{at-qx} - 1\right) \qquad (36)$$

where A, a, and q are constants. Substituting this expression for θ, in (21), we find that $a = a^2 q^2$.

Now

$$\theta_1 = 0, \text{ for } at - qx = 0$$

$$\theta_1 = 0, \text{ for } x = e$$

whence

$$at - q\varepsilon = 0$$

$$\varepsilon = \frac{at}{q} = q\, a^2 t. \qquad (37)$$

The expression shows that the thickness of ice may increase in direct proportion with the time.

From (25)

$$A = \frac{c\, a^2 q^2 A^2}{a^2\, \lambda} = \frac{cA^2}{a\lambda}.$$

Hence between A and a there exists the following relation:

$$a = \frac{A\, c}{\lambda}. \qquad (38)$$

For $x = 0$, we obtain from (36)

$$\theta_s = \frac{A}{a}\left(e^{at} - 1\right)$$

$$= \frac{A}{a}\left(\frac{at}{1!} + \frac{a^2t^2}{2!} + \frac{a^3t^3}{3!} + \ldots\ldots\right)$$

$$= At + \frac{c}{\lambda}\frac{A^2t^2}{2!} + \frac{c^2}{\lambda^2}\frac{A^3t^3}{3!} + \ldots\ldots \qquad (39)$$

Each of these formulas, however, contains some unknown constants a or A.

If we introduce the expression (37) into (27), we reach another expression,

$$\frac{c\,\theta_s}{\lambda} = q^2t + \frac{q^4t^2}{2!} + \frac{q^6t^3}{3!} + \ldots\ldots = e^{q^2t} - 1. \qquad (40)$$

If ε is very small, the formula (27) may be reduced to the form,

$$\frac{c\,\theta_s}{\lambda} = \frac{2}{2a^2}\frac{d\varepsilon^2}{dt}$$

whence

$$\varepsilon^2 = \frac{2k}{\lambda\rho_1}\int_0^t \theta_s\, dt \qquad (41)$$

θ_s may be variable, and if it is a function of t,

$$\varepsilon^2 = \frac{2k}{\lambda\rho}\int_0^t f(t)\, dt.$$

If we assume that the temperature of ice increases uniformly from its upper surface downward, the quantity of heat $\frac{k\theta_s}{\varepsilon}\, dt$ flows upward through the ice in the time dt. In the same time, a layer of ice whose thickness is $d\varepsilon$ is formed and the quantity of heat $\lambda\rho_1 d\varepsilon$ is set free; therefore we have

$$\frac{k\theta_s}{\varepsilon}\, dt = \lambda\rho_1 d\varepsilon$$

from which

$$\varepsilon^2 = \frac{2k}{\lambda\rho_1}\int_0^t \theta_s\, dt$$

which was already obtained in (41).

If θ_s is constant,

$$\varepsilon = \sqrt{\frac{2\,\theta_s\, k\, t}{\lambda\rho_1}} \qquad (42)$$

It is to be regretted that the analysis, so far, is very incomplete and unsatisfactory. In fact, some formulas have been deduced upon the assumption that the temperature of the upper surface of ice θ_s is constant, and others upon the assumption that the thickness of ice ε is very small or that the temperature gradient in ice is constant. Moreover, the whole operation is based upon the assumptions that the temperature of water is everywhere and always equal to zero, and that the heat flows upward only, and the latent heat of fusion of ice never warms up the water next the ice. The change in density, when water freezes into ice, was also neglected.

If it be satisfactorily completed, however, the theory of ice formation may be applicable to a few interesting problems. When a lake or the polar seas are covered with a thin uniform layer of ice, the ice grows gradually thicker if the temperature of the air be below the freezing point. This is caused by the passage of heat through ice from the water immediately below it. Thus the layer of water next the ice freezes, setting free the latent heat of fusion of ice. As the temperature is the same throughout any horizontal layer, the transference of heat

is vertically upward, or perpendicular to such layers. Stefan applied some of his formulas to the phenomena of ice formation in the polar seas, notably in the Gulf of Boothia, Assistance Bay, Port Bowen, Walker Bay, Camden Bay, and others, and computed the value of a_1^2, which is $\frac{k_1}{\rho_1 c_1}$ to be 0,0042 (C. G. S.) which value lies between the value of Neumann (0.0057) and that of Forbes (0.00223). This is rather a remarkable result. But Stefan's application must be criticized because he took simply for the surface condition $\theta=\theta_a$ for $x=0$. θ_a is primarily the temperature of the outer surface of ice, and not that of the atmosphere itself, as Stefan assumed. Hence our surface condition must be $\left[k_1 \frac{\partial \theta_1}{\partial x}\right]_{\lambda=0} = \sigma(\theta_1-\theta_a)$ when σ is the emissivity of ice and θ_a may be the temperature of the atmosphere, if we assume that heat is radiated from ice surface toward the atmosphere only and not toward space. The fact is, however, that the influence of the temperature of the atmosphere on ice formation is seemingly small. The natives of Bengal, in India, make ice in fields freely exposed to the sky. Small excavations are made in the black loam soil, at the bottom of which are spread small sheaves of rice straw, and upon the top of this is placed light, loose straw to the depth of one and one-half feet. Upon this shallow and porous earthen dishes filled with water are exposed during clear nights. Ice is produced in large quantities when the air temperature is 16° to 20° F. above the freezing point. This shows that ice formation is in great part due to radiation to space. Hence θ_a must be the so-called sky temperature, which represents both the siderial and the atmospheric temperature.

If the temperature of the air is higher than that of ice, the ice begins to melt gradually, and at the same time a part of the heat flows into the ice downward. This is equivalent to saying that cold flows outward from the interior of ice and retards the melting of the surface of ice by the warmer air. Therefore, the principles of ice formation may be applicable to this problem, if we give the formulas the opposite signs.

The penetration of frost into the moist soil is another interesting problem in the application of the theory of ice formation. If the temperature of the earth's surface is cooled below the freezing point, the frost is formed over the earth's surface and penetrates gradually deeper into the earth, which process is exactly similar to the formation of ice in a lake or in the polar seas.

All these problems are examples of heat conduction in one dimension, which is the simplest of all cases. If we suppose that a vessel filled with water is surrounded by brine, the layer of water nearest to the brine begins to freeze. Heat flows outward from the water and the layer of ice will grow toward the center of the vessel. If the vessel be a parallelopiped, our subject becomes the difficult problem of heat conduction in a parallelopiped of ice. If the vessel be a cylinder the problem becomes the most difficult, and may possibly require the assistance of the theory of Bessel's functions, if, indeed, the problem be soluble at all. It is in general very difficult to determine the variation of temperature in a limited body.

Prof. Cleveland Abbe asked me sometime ago if I could solve the problem of ice formation more completely, and if I would also prepare a paper to point out to American meteorologists how much on the subject has been done by mathematical and experimental physicists, and what ought to be done by meteorologists. Now I communicate this preliminary paper to the WEATHER REVIEW, with the hope that the problem may interest some of the theoretical as well as practical meteorologists, and also with the expectation that I may offer in the near future some more general solution of the problem than those above given.

NOTES AND EXTRACTS.

THE FOURTH INTERNATIONAL CONFERENCE ON AERIAL RESEARCH.

In the Meteorologische Zeitschrift for January Dr. A. De Quervain gives a general report on the proceedings of the fourth conference of the international committee for scientific ballooning or aerial investigation. The conference was held at St. Petersburg, August 29–September 3, 1904, in the rooms of the Imperial Academy of Sciences.

After enumerating the papers read at the conference, De Quervain gives the following abstract of Professor Hergesell's report on his kite work on the Atlantic Ocean. This work, which was carried out on the yacht belonging to the Prince of Monaco, began in the middle of July off the coast of Portugal, and was extended southward to twenty nautical miles southwest of the Canaries. From the middle of August onward the work was prolonged in the direction of the Azores after Hergesell had left the yacht. The trade wind was blowing off the coast of Portugal, and increased in strength in proportion as the yacht moved southward. North of the Canaries there was a northeast wind of seven or eight meters per second. The trade wind diminished with altitude above sea level until it was inappreciable. The kites attained altitudes as high as 4500 meters. The following conditions were observed in the trade region: in the lowest strata of a few hundred meters thick the temperature diminished adiabatically; then followed a sharp passage into a layer having an inverse gradient, generally of the considerable thickness of a thousand meters, in which the temperature rose, and which was generally very dry, namely, relative humidity of 10 or 12 per cent. Above this came another layer, with adiabatic temperature gradients, whose upper limit was not attainable, but which certainly extended to an altitude of 5000 meters. As the kite ascended, the wind backed from northeast to northwest and diminished to a very feeble movement in the inversion layer. A southwest wind, or anti-trade proper, was not observed in these kite ascensions up to 4500 meters. Professor Hergesell considers the westerly winds observed on the peak of Teneriffe as being of a local nature. As to the presence of local winds, very interesting observations were made in the neighborhood of the Canary Islands. A general account of the results of this work will probably soon be published in the Comptes-Rendus, after presentation by the Prince of Monaco to the Academy of Sciences in Paris. The publication in extenso will be made in Hergesell's Beiträgen to the physics of the free atmosphere.

The new edition of the International Cloud Atlas has now been provided for financially and the publication will be hastened.

As to the organization of the international balloon work, the committee decided that not only should the monthly ascensions, on specified dates, continue as heretofore, but also that ascensions should be made as frequently as possible on three consecutive days during two months of 1905, namely, April and also the 29th, 30th, and 31st of August. These last dates were chosen with reference to the great total eclipse of the sun, which will occur on August 30, and on which occasion the Spanish Government desires that ascensions shall be made in Spain within the path of totality. The hour of the day for simultaneous international ascensions was postponed, since the newer meteorographs are so well protected against sunshine that they give correct records of the temperature of the air, and insolation is not so much to be feared. The committee

adopted Professor Köppen's suggestion that the ascensions take place at the hour when the ordinary observations for telegraphic interchange are made in the morning. Teisserenc de Bort, as the result of eighteen years of balloon work, states that about 4 per cent of the sounding balloons are lost, but that many times they are found, after many months, with the records in usable condition. Attention is called to the importance of special observations of clouds by experienced observers whenever balloon ascensions are made.

The committee unanimously expressed the opinion that the continuation of the publication in full of the international observations in the free air is of the greatest importance and is absolutely necessary in the progress of scientific meteorology, and requested all nations to heartily support this work, which has hitherto been supported by the German Government only, but whose cost should be defrayed by all conjointly. The Russian Government has undertaken to communicate through diplomatic channels the plan of cooperation that was devised, and will also request active cooperation in balloon work.

With regard to kite work on the oceans, the committee resolved that this had a very special interest for meteorology, and requested that individual governments should consider the propriety of furnishing apparatus and instructed experts so that regular kite ascensions might be carried out on the steamers of all lines that are subsidized by the respective governments. It is requested that meteorological institutes and scientific societies should bring this idea to the attention of all steamship companies and enlist their cooperation in this new field of work.

A modification of the kite was exhibited to the committee; namely the Kufnetzof semicylindrical kite; these kites are remarkably small and light and therefore exert a slight pull on the kite line, seldom exceeding five kilograms; consequently the weight of the cable and the strength of the reel may be correspondingly diminished. This kite was first used in Pavlosk, where it has made many high ascensions. The kite meteorograph devised by Kufnetzof is not attached to the kite, but hangs from the kite line, below it, and by means of a wedge-shaped jacket the anemometer of the self-register is made to stand vertical and quiet.

Teisserenc de Bort, while continuing to use his paper balloons, has also turned his attention to the elastic india-rubber balloons, for which he has made a new, very light meteorograph, using a bimetallic thermometer very well ventilated. Doctor Shaw, of England, exhibited a peculiar, cheap kite meteorograph devised by Dines. Professor Hergesell exhibited three different meteorographs: 1st, a light instrument for kites; 2d, the ordinary model for rubber balloons; 3d, a new instrument for manned balloons, having an electrically ventilated aspiration thermometer. The newest forms of Hergesell-Bosch self-registers have clocks made in Switzerland of nickel steel which continue to go even in the lowest temperatures.

Of the greatest importance for the accurate measurement of pressures is the principle theoretically announced by Rosenthal in his memoir on the elastic reaction of aneroids during balloon ascensions and confirmed by the experimental work done at Strasburg by Professor Hergesell, i. e., that the compensation depends entirely upon the external pressure, so that the method hitherto used to compensate aneroids against the influence of temperature under high pressures that prevail at the earth's surface introduces an error of compensation that may be equivalent to 2000 meters at the greatest heights attained by balloons. It will be very important to properly consider these investigations in studying the international simultaneous ascensions.

It is not recommended that any one form of self-register shall be adopted in general but that each be fully described and investigated when it is used. Most of the instruments now in use have some value, but all are open to further improvements. The Hergesell tube thermometer is undoubtedly the most sensitive, but is delicate and needs careful handling. The various bimetallic thermometers are sufficiently sensitive to allow of comparison with the tube thermometer, since the accidental error is of almost the same magnitude as the difference in sensitiveness. The important points are the calibrating and handling of the instruments, the proper consideration of the aneroid compensation, and the critically accurate reduction of the curves of the self-register.

The next conference on aerial work will be held in Rome, probably in 1906, and only members of the committee will be invited. At the recent meeting numerous outsiders were present and took part in the discussions, but the official delegates represented Germany, England, France, Italy, Russia, Sweden, and Spain. Austria-Hungary and Switzerland were represented by unofficial delegates.—*C. A.*

THE METEOROLOGIA GENERALE DI LUIGI DE MARCHI.

The author of this book is the well known professor of physical geography and meteorology at the University of Padua, the scene of Galileo's lectures which laid the foundation for modern experimental science. Besides a number of scientific memoirs, Marchi has written several popular works on climatology and meteorology. His personal studies have been in the direction of the elucidation of the dynamics of the atmosphere and the work we have in hand is the second, much enlarged, edition of a former treatise elucidating this subject; it is simply a short treatise on physical meteorology, which, as he says, has undergone a radical transformation in the past twenty years. The composition of the air, the laws for the transformation of aqueous vapor, the static and dynamic condition of a vertical column of the atmosphere are now looked upon from a different standpoint; the theories of meteorological apparatus have now become more precise; the meteorological importance of atmospheric electricity has become better defined and meteorology in general has come to occupy a higher position as a natural philosophy. A booklet of 225 pages, 16-mo, can, of course, give only a brief account of the more prominent features of our present knowledge of meteorology, but the author has apparently selected wisely and the Italian reader will certainly find this manual, which belongs to the series published by Ulrico Hoepli of Milan, leading him in the right direction and preparing him for the more critical study of advanced treatises and special memoirs.

The volume is divided into four sections and subdivided into seventeen chapters. The first section, on the atmosphere, considers the physical properties of the air and the structure of the atmosphere, the action of aqueous vapor and of atmospheric electricity. The second section relates to equilibrium and motion, barometric pressure, the laws of motion both horizontal and vertical, and the conditions of equilibrium. The third section deals with the temperature of the air, its horizontal and vertical distribution and its periodic variations. The fourth and last chapter gives the application of the preceding sections to the irregularities and the prediction of the weather; its four sections relate to simple types of isobars and their movements over the globe, followed by complex types of isobars and the practicability of the weather prediction. In a short appendix, pp. 218-23, Marchi gives the elements of the theory of the diurnal variations of the barometer together with the results of Hann's investigations, according to which the second term in the harmonic series is uniform over the whole world and may therefore depend upon something entirely outside the atmosphere, while the first term varies with latitude, temperature, and continentality.

If this popular manual indicates fairly the instruction in meteorology given in the Italian schools, then it must be acknowledged that they are in advance of the high schools of the United States. We see no reason why a popular manual

of this grade should not be introduced into the American schools to the great advantage of our pupils. The advantage would consist, not in the facts and statistics with which their memories are burdened, but in the logical reasoning processes by which the pupil is led to dwell only on the important factors that control the meterological phenomena.—*C. A.*

PERNTER'S THEORY OF THE RAINBOW.

On page 503 of the MONTHLY WEATHER REVIEW for November, 1904, we published an article by Rev. D. Hammer, S. J., on "Airy's theory of the rainbow." Prof. J. M. Pernter has called the attention of the author to the fact that fig. 2, page 505, might convey the erroneous idea that all the rays when prolonged meet in one point.

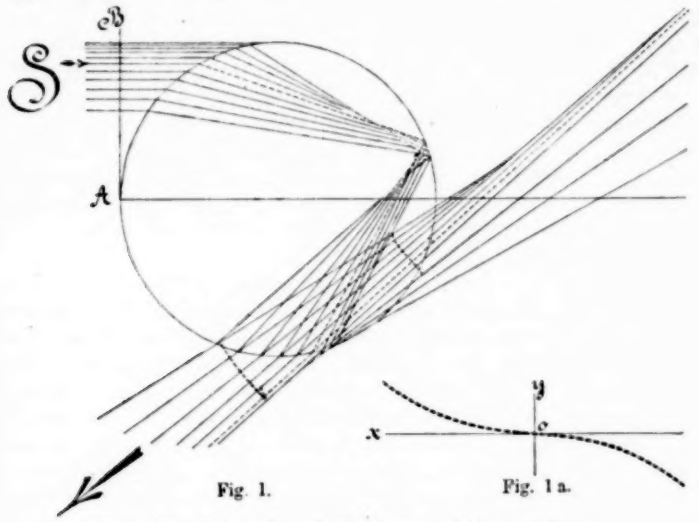


Fig. 1. Fig. 1a.

FIGS. 1 and 1a.—Pernter's theory of the rainbow.

The exact path of these rays has been worked out very carefully and laboriously by Professor Pernter in his memoir entitled "Ein Versuch, der richtigen Theorie des Regenbogens Eingang in die Mittelschulen zu verschaffen," and the accompanying figs. 1 and 1a from this work, which we publish at Mr. Hammer's suggestion, explain more accurately than that on page 505 the exact paths followed by the rays and the method of their interference so as to form caustics and bands of colors. Professor Pernter has made the whole process of reflection and interference so plain by graphic constructions that his work, which ought to be translated among the classics of science, is commended to high school teachers throughout the country.—*C. A.*

METEOROLOGY IN HAITI.

Under date of February 16, Prof. R. T. Constantine, Professor of Physics in the St. Louis Gonzaga College, Port au Prince, Haiti, informs the Chief of the Weather Bureau that he has organized in that Republic a society which has adopted the name "The Astronomical and Meteorological Society of Port au Prince." This society has been officially approved by the Minister of the Interior, who promises the hearty support of the government. The first business of the society will be to establish meteorological stations at different points in the Republic, in order to determine the climatological elements proper to each of these localities and to the country in general. In the beginning only thermometric stations will be established, where maximum and minimum temperatures, winds, hydrometeors, thunderstorms, and earthquakes will be observed. In order to equip ten climatological stations Professor Constantine hopes that the U. S. Weather Bureau will contribute the necessary apparatus. But as this is quite beyond the legal power of the Chief of Bureau, we may express the hope that the friends of science in America will come to the help of this new enterprise. The study of climate in its relation to agriculture has been prosecuted for a century very diligently in the Temperate Zone, but very little is known of this important subject with reference to tropical climates.

It may, however, be added that Port au Prince, Haiti, will be established as a regular telegraphic reporting station of the U. S. Weather Bureau during the hurricane season. It will have the complete outfit of a first-class station, and will be installed by a regular Weather Bureau observer, and then left in charge of Professor Constantine.—*C. A.*

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. James L. Bartlett, Observer, Madison, Wis., on February 8 addressed 200 members of the Wisconsin Agricultural Experiment Association, composed of graduates of the College of Agriculture of the University of Wisconsin. He discussed the value of the Weather Bureau to the farmers and explained the use of the weather map.

Beginning with next fall, Mr. Bartlett's course at the University of Wisconsin will extend throughout the college year, the second semester being devoted more particularly to the study of climatology.

Mr. S. S. Bassler, Local Forecaster at Cincinnati, Ohio, on February 11 delivered an address on "Weather" before the Oxford Farmers' Institute at Oxford, Ohio.

Prof. Henry J. Cox, Chicago, Ill., has begun a series of lectures in that city and vicinity, illustrating with lantern slides the movements of storms, cold waves, and other atmospheric conditions and their effects. He treats in a general way the forecast work of the Weather Bureau. The first lecture was delivered before the Church Men's Club at Englewood, Ill., on February 20; the second was given on February 28 at the regular monthly meeting of the Chicago Academy of Sciences.

The executive committee of the Geographic Society of Chicago, which has decided to publish a bulletin on the teaching of meteorology, has requested Professor Cox to act as chairman of a committee for the preparation of this bulletin.

Mr. W. C. Devereaux, Assistant Observer, Ithaca, N. Y., will give a course in agricultural meteorology and climatology at the Agricultural College of Cornell University during the last half of the present school year. The course includes one lecture and two quiz and laboratory periods each week, and the following lectures will be given during the term:

1. Temperature. Radiant energy; effect of different rays upon vegetation; importance of diffused daylight for vegetation; reflected heat; terrestrial radiation; soil temperatures; sensible temperatures.
2. Precipitation. Causes of unequal distribution and effects of; data to be considered; capacity of soils; plant requirements; water for irrigation; and the value of reliable observations.
3. Floods. Classes; river basins; sources of flood water; rise, crest, velocity, and methods of predicting stages.
4. Weather. Defined; changes produced by passage of cyclones and anticyclones; hurricanes; cold waves.
5. Weather maps. Method of preparing daily map; practise in preparing.
6. Forecasting the weather. Method employed; meaning of terms used; results obtained.
7. Practise forecasting. Practise forecasts made from weather maps and compared with resulting conditions; special types considered.
8. Long-range forecasts. Defined; relative effect upon the weather of different factors; results.
9. Climate. Defined; effects of latitude, altitude, oceans, forests, etc.
10. Climate and plants. Distribution and development of plants as depending on climate.
11. Climate and man. Effects of climate on the human race.
12. Meteorology in the schools. The extent to which meteorology is taught in the schools to-day and how it can be increased.
13. The meteorological services of the world. A history of the different services and their importance.

Mr. C. W. Ling, Assistant Observer, Havre, Mont., reports that the superintendent of public schools, with the high school class, visited the local Weather Bureau office on February 24 and received instruction in the use and construction of meteorological instruments, the work of the Weather Bureau, and methods of forecasting.

Mr. George A. Loveland, Section Director, Lincoln, Nebr., on February 14 delivered a lecture, "How the weather is made," before the Men's Club of the First Congregational Church.

Mr. E. H. Nimmo, Observer, Sandusky, Ohio, states that the class in physical geography visited the office in two sections on February 21 and 23. They were instructed in the use of instruments, the preparation of the daily weather map, and methods of forecasting.

Mr. George Reeder, Section Director, Columbia, Mo., is giving a course of lectures on meteorology and climatology at the University of Missouri.

Mr. Edward B. Richards, Section Director, Little Rock, Ark., delivered three lectures during February, at the local office of the Weather Bureau, to classes in physical geography from the Cramer School and the Peabody High School. The instruction consisted in an explanation of the instruments, weather maps and charts, and the value of the Weather Bureau records, with some remarks on forecasting and the general work and methods of the Bureau.

Mr. H. W. Richardson, Local Forecaster, Duluth, Minn., spoke on February 28 to the "Physiography Section" of the Duluth State Normal School, and on March 6 to the 35 pupils of the class in physical geography of the Superior, Wis., High School. In both cases the instrumental apparatus was thoroughly explained, followed by a lecture on forecasting and the general work of the Bureau.

Mr. George N. Salisbury, Section Director, Seattle, Wash., is giving a course of two lectures per week in practical meteorology at the University of Washington.

Mr. Richard H. Sullivan, Observer, Grand Junction, Colo., delivered a series of three lectures, illustrated with lantern slides, before the high school students and friends of the school, from 200 to 300 being in attendance. The lectures were as follows:

January 20. The atmosphere; pressure, temperature, moisture, winds, general circulation.

February 17. The Weather Bureau; history, explanation of apparatus, discipline, and detail work.

March 17. Four types of storms common to the United States—cyclones (warm waves and cold waves), hurricanes, thunderstorms, tornadoes; forecasting; and the Weather Bureau's relation to public interests.

Mr. John R. Weeks, Observer, Macon, Ga., on February 20, delivered a lecture, illustrated with lantern slides, before the Current Topics Club of Macon. On February 22 he addressed the Georgia State Fruit Growers' Association, in session at Macon. The lectures were on meteorology; the Weather Bureau and its work; the weather, what it is and how forecast; practical application of weather forecasts. In the lecture to the fruit growers particular stress was laid upon cold waves and the protection of fruit from frosts and injurious temperatures.—*F. O. S.*

THE WEATHER OF THE MONTH.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and V.

The mean barometric pressure for the month was highest over the slope and central valley regions, and the lowest over the southern Plateau and south Pacific regions.

The maximum mean readings ranged from 30.30 to 30.33 inches and were reported from the eastern parts of Kansas, Nebraska, South Dakota, and the western portions of Iowa and Missouri. The minimum mean reading was reported from southwestern California.

The mean pressure for the month was below normal in the western portions of Oregon and Washington, in Nevada, excepting the extreme northeastern portion, extreme southwestern Utah, western Arizona, and California, with the greatest negative departures, —.10 to —.14 inch, over California. In all other districts the mean pressure for the month was above the normal, and over the greater portion of the area of positive departure the changes were quite marked. Over northwestern Texas, Oklahoma and Indian Territories, extreme western Missouri, Kansas, Nebraska, and central and western South Dakota, the departures ranged from +.20 to +.25 inch, the maximum departures being reported from central Nebraska and western Kansas.

Over New England, except Maine, the Middle Atlantic States, northern portion of the South Atlantic States, upper Ohio Valley and Tennessee, lower Lake region, and southeastern portion of the upper Lake region, the mean pressure for the month increased over that of January, 1905; in all other districts it decreased from that of the preceding month. The increases in pressure were very slight, while the decreases were, as a rule, quite marked, and ranged from —.10 to —.18 inch over western Minnesota, the Dakotas, eastern Montana, western Colorado, northwestern New Mexico, southern Utah, southern Nevada, California generally, and northern Arizona.

TEMPERATURE OF THE AIR.

The mean temperature for the month was above the normal in Arizona, Utah, Nevada, California, Oregon, western Washington, northern North Dakota, and northwestern Minnesota. In all other districts the mean temperature for the month was below the normal.

As a rule the positive departures were rather slight—the greatest being +4.2° in southwestern California, and +5.1° in northwestern Minnesota—while the negative departures generally were very marked, being —6.0°, or more, over the greater portion of the area of deficient temperature, and from —10.0° to —13.4°, over Texas, except the extreme southwestern portion, Louisiana, except the extreme southeastern portion, Mississippi, northern Alabama, northwestern Georgia, Tennessee, Kentucky, southern Ohio, the southern and central portions of Indiana and Illinois, extreme southeastern Iowa, Missouri, except the extreme northwestern portion, Arkansas, Oklahoma and Indian Territories, Kansas, except the northeastern portion, and west-central Nebraska.

The mean temperature for the month was as low as any previously recorded during February at Atlantic City, N. J., Binghamton, N. Y., Block Island, R. I., Chattanooga, Tenn., Columbia, S. C., Fort Smith, Ark., Fort Worth, Tex., Indian-

apolis, Ind., Louisville, Ky., Northfield, Vt., Oklahoma, Okla., Palestine, Tex., Springfield, Ill., Springfield, Mo., and Washington, D. C.; 1° lower at Amarillo and Corpus Christi, Tex., Harrisburg, Pa., Nantucket, Mass., St. Louis, Mo., San Antonio, Tex., and Shreveport, La.; 2° lower at Birmingham, Ala., Hannibal, Mo., Lewiston, Idaho, Macon, Ga., and Richmond, Va.; 3° lower at Kalispell, Mont., and 7° lower at Taylor, Tex. At Fresno, Mount Tamalpais, and San Luis Obispo, Cal., the mean temperature for the month was as high as any previous February record; 1° higher at Point Reyes Light and San Diego, Cal., and 3° higher at North Head, Wash.

Maximum temperatures of 80°, or higher, occurred in southern and central Florida, south-central Texas, southwestern Arizona, and southeastern California. The lowest maximum temperatures recorded ranged between 30° and 40° and were reported from northwestern New England, northwestern Ohio, northeastern Indiana, lower Michigan, and eastern upper Michigan.

The maximum temperature for the month was as high as recorded during any previous February at Cheyenne, Wyo., and Portland, Oreg.; 1° higher at Tacoma, Wash.; 2° at Williston, N. Dak.; 3° at Havre, Mont., and 4° higher at Lincoln, Nebr.

Freezing temperatures occurred everywhere, except in central and southern Florida, and the southwestern portions of Arizona and California. Zero temperatures occurred as far south as a line drawn from northeastern Massachusetts southwestward to central Alabama, thence northwestward to central Arkansas, southwestward to the southern boundary of eastern Arizona, northwestward to east-central California, and northward to the northern boundary of central Washington. Minimum temperatures of from 40° to 50° below zero were reported from extreme northern Minnesota, the extreme northern, western, and south-central portions of North Dakota, northwestern South Dakota, Wyoming generally, west-central Colorado, and eastern and north-central Montana; and temperatures 50° to 53° below, from north-central Montana and portions of central Wyoming.

The minimum temperature for the month was as low as recorded during any previous February at Knoxville, Tenn., and Lincoln, Nebr.; 1° lower at Omaha, Nebr., and Pierre, S. Dak.; 2° lower at Cheyenne, Wyo., and Davenport and Des Moines, Iowa; and 5° lower at Hannibal, Mo., and Keokuk, Iowa.

The mean temperature for the day was 10°, or more, below the normal generally over the geographic district in New England on the 1st, 3d to 5th, inclusive, 11th, 12th, 14th to 16th, inclusive, 18th, and 19th; Middle Atlantic States, 1st to 5th, inclusive, 8th, 11th, 14th to 16th, inclusive, 18th and 19th; South Atlantic States, 3d to 5th, inclusive, 7th, 8th, and 14th to 19th, inclusive; Florida Peninsula, 15th; east Gulf States, 2d to 8th, inclusive, 13th to 16th, inclusive, and 18th to 20th, inclusive; west Gulf States, 1st to 8th, inclusive, and 12th to 20th, inclusive; Ohio Valley and Tennessee, 1st to 7th, inclusive, and 10th to 18th, inclusive; lower Lake region, 2d to 4th, inclusive, 7th, 11th, 13th to 16th, inclusive, and 18th; upper Lake region, 1st to 3d, inclusive, 7th, 10th to 15th, inclusive, and 18th; upper Mississippi Valley, 1st to 4th, inclusive, 6th, 7th, and 10th to 16th, inclusive; Missouri Valley, 1st to 7th, inclusive, and 9th to 15th, inclusive; North Dakota, 1st to 6th, inclusive, and 9th to 13th, inclusive; northern slope, 1st to 6th, inclusive, and 9th to 12th, inclusive; middle slope, 1st to 7th, inclusive, and 9th to 15th, inclusive; southern slope, 1st to 10th, inclusive, 12th to 14th, inclusive, 18th and 19th; southern Plateau, 13th; middle Plateau, 11th to 14th, inclusive; northern Plateau, 11th to 13th, inclusive; and north Pacific, 11th and 12th. The mean temperature for the day was 10°, or more, above the normal generally over the district in the upper Lake region on the 20th and 25th; upper Mississippi Valley, 28th; Missouri Valley, 22d to 28th, inclusive; North Dakota and northern slope, 19th to 28th, inclusive; middle slope, 23d to 25th, inclusive, 26th and 28th; southern slope, 26th; and northern Plateau, 20th to 25th, inclusive, 27th, and 28th.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	19.8	— 5.8	— 9.0	—4.5
Middle Atlantic	12	25.4	— 8.4	—11.8	—5.9
South Atlantic	10	40.3	— 8.6	—12.9	—6.4
Florida Peninsula*	8	61.3	— 1.2	— 5.4	—2.7
East Gulf	9	42.9	—10.3	—15.9	—8.0
West Gulf	7	39.9	—11.6	—14.5	—7.2
Ohio Valley and Tennessee	11	26.9	—10.6	—17.1	—8.6
Lower Lake	8	18.4	— 8.1	—12.4	—6.2
Upper Lake	10	13.4	— 5.5	— 8.9	—4.4
North Dakota*	8	8.3	+ 1.2	— 3.7	—1.8
Upper Mississippi Valley	11	16.9	— 9.2	—14.3	—7.2
Missouri Valley	11	16.6	— 7.9	—13.1	—6.6
Northern Slope	7	16.6	— 4.4	— 3.7	—1.8
Middle Slope	6	23.4	— 9.0	—13.3	—6.6
Southern Slope*	6	28.9	—11.4	—15.9	—8.0
Southern Plateau*	13	42.9	+ 0.6	+ 3.7	+1.8
Middle Plateau*	8	30.3	+ 1.2	+ 4.8	+2.4
Northern Plateau*	12	28.2	— 0.6	+ 3.1	+1.6
North Pacific	7	42.9	+ 2.3	+ 4.3	+2.2
Middle Pacific	5	52.2	+ 3.0	+ 5.8	+2.9
South Pacific	4	56.7	+ 3.2	+ 7.8	+3.9

* Regular Weather Bureau and selected cooperative stations.

In Canada.—Prof. R. F. Stupart says:

The mean temperature of February was above average in Manitoba and the Northwest Territories and in parts of British Columbia, and was below average from Lake Superior to the Maritime Provinces. The positive departures in the Northwest Territories ranged from 1° at Calgary to 5° at Edmonton and 8° at Prince Albert, and were in strong contrast to the conditions of February, 1904, in which month the departures from average were all negative, ranging from 6° in Manitoba to as much as 15° in Alberta. In northern Ontario the mean was about 4° below the average, and in southern Ontario it was 6° below. In Quebec it ranged between 3° and 5° below, and in the Maritime Provinces between 2° and 6° below.

PRECIPITATION.

The precipitation was above the normal in southeastern Virginia, eastern and central North Carolina, South Carolina, central and southern Georgia, northern Florida, Alabama, Mississippi, Louisiana, southeastern and western Texas, western Oklahoma, western and central Kansas, southern Nebraska, southeastern Wyoming, Colorado, New Mexico, Arizona, southern Nevada, southern California, northeastern Iowa, southeastern Wisconsin, and about the eastern end of Lake Ontario; in all other districts it was below the normal. The greatest excesses occurred over southwestern Alabama, and the greatest deficiencies in northwestern California, western Oregon, and southwestern Washington.

Precipitation was general over the several districts on the dates given: New England, 2d, 6th, 9th, 10th, 12th, 13th, 15th, and 17th; Middle Atlantic States, 1st, 2d, 5th, 6th, 8th, 9th, 12th, 13th, 15th, 20th, 22d, 23d, 25th, 26th, and 28th; South Atlantic States, 1st to 6th, inclusive, 8th, 9th, 11th to 13th, inclusive, 20th, 21st, and 25th; Florida Peninsula, 3d, 4th, 11th, 13th, and 14th; east Gulf States, 3d to 8th, inclusive, 11th to 13th, inclusive, 19th, and 20th; west Gulf States, 1st to 4th, inclusive, 6th to 8th, inclusive, 11th, 12th, and 17th to 19th, inclusive; Ohio Valley and Tennessee, 1st, 5th, 6th, 8th, 9th, 12th, 13th, 20th, 25th, and 27th; lower Lake region, 1st, 4th to 6th, inclusive, 8th to 10th, inclusive, 12th to 15th, inclusive, 17th, 22d, and 25th; upper Lake region, 5th, 6th, 8th, 10th, 11th, 12th, 14th, 16th, 17th, and 24th; upper Mississippi Valley, 4th, 5th, 6th, 7th, 11th, 14th, and 24th; Missouri Valley, 3d to 5th,

inclusive, 8th to 11th, inclusive, and 14th; North Dakota, 8th, 10th, 13th, and 16th; northern slope, 8th, and 10th; middle slope, 1st to 8th, inclusive, and 10th to 12th, inclusive; southern slope, 1st to 7th, inclusive, 12th, 17th, and 18th; southern Plateau, 2d to 6th, inclusive, 15th to 18th, inclusive, 22d, 23d, 27th, and 28th; middle Plateau, 1st to 3d, inclusive, 5th, 10th, 11th, and 16th; northern Plateau, 3d, 7th, 9th, 10th, and 20th; north Pacific, 7th to 9th, inclusive, 17th to 24th, inclusive, and 27th; middle Pacific, 1st to 5th, inclusive, 16th, 17th, and 19th; and south Pacific, 1st to 5th, inclusive, and 15th to 17th, inclusive.

Snowfall occurred over the entire United States except in the southern portion of Georgia, Florida, southwestern Arizona, and along the coast and over the lowlands of California. Over the southern portion of the Rocky Mountain and Plateau regions the snowfall was generally above the normal.

At the end of the month considerable snow still remained on the ground in New England, New York, Michigan, and Wisconsin, with measurable amounts extending south to the Ohio River and into the mountain sections of Maryland and the Virginias, and westward to the Mississippi Valley. Over the Great Plains the snow had practically disappeared, as also over the Mountain and Plateau regions, except at elevated points.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	8	1.78	51	—1.7	—1.5
Middle Atlantic	12	2.50	76	—0.8	—0.8
South Atlantic	10	4.90	132	+1.2	—0.9
Florida Peninsula*	8	2.52	81	—0.6	—2.0
East Gulf	9	7.08	151	+2.4	+2.6
West Gulf	7	2.88	85	—0.5	—1.0
Ohio Valley and Tennessee	11	2.83	67	—1.4	—3.1
Lower Lake	8	1.85	67	—0.9	—1.0
Upper Lake	10	1.28	68	—0.6	—1.2
North Dakota*	8	0.34	63	—0.2	—0.5
Upper Mississippi Valley	11	1.24	67	—0.6	—1.0
Missouri Valley	11	1.05	84	—0.2	—0.1
Northern Slope	7	0.31	51	—0.3	—0.4
Middle Slope	6	0.77	100	0.0	+0.1
Southern Slope*	6	1.42	178	+0.6	+0.2
Southern Plateau*	13	3.01	249	+1.8	+2.6
Middle Plateau*	8	1.53	124	+0.3	0.0
Northern Plateau*	12	0.64	42	—0.9	—1.6
North Pacific	7	3.35	59	—2.3	—4.3
Middle Pacific	5	2.33	55	—1.9	—2.2
South Pacific	4	5.09	189	+2.4	+1.6

*Regular Weather Bureau and selected cooperative stations.

In Canada.—Professor Stupart says:

The precipitation was less than average throughout the Dominion, except locally near Montreal and in the Maritime Provinces. In the Territories and Manitoba the total for the month was but a few inches of snow. In Ontario and Quebec the precipitation was almost wholly in the form of snow, of which the total fall was not heavy, averaging between 12 and 23 inches, except quite locally over small districts, where there were moderately heavy falls.

In the Maritime Provinces the snowfall was heavy in Nova Scotia and Prince Edward Island and was quite equal to average in New Brunswick.

At the close of the month Manitoba and the Territories were bare of snow, with the exception of a very small amount in some of the more northern and wooded districts. From Lake Superior eastward the Dominion was snow covered. In Ontario the depth varied generally between 18 and 30 inches, with more in small scattered districts on the higher lands and less in the Niagara Peninsula. In Quebec the depth ranged from about 26 to 42 inches and in the Maritime Provinces the general depth was even greater, and as much as 50 inches on the level was reported from Charlottetown.

HUMIDITY.

The relative humidity was normal in the Middle and South Atlantic States, and middle Pacific district; below normal in New England, North Dakota, and the northern Plateau and north Pacific districts; and above normal in all other districts.

The averages by districts appear in the following table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	70	— 5	Missouri Valley	80	+ 5
Middle Atlantic	74	0	Northern Slope	75	+ 4
South Atlantic	76	0	Middle Slope	76	+ 9
Florida Peninsula	81	+ 1	Southern Slope	77	+ 9
East Gulf	78	+ 2	Southern Plateau	69	+22
West Gulf	75	+ 1	Middle Plateau	73	+ 9
Ohio Valley and Tennessee	77	+ 3	Northern Plateau	72	— 3
Lower Lake	81	+ 1	North Pacific	74	—11
Upper Lake	83	+ 1	Middle Pacific	76	0
North Dakota	78	— 2	South Pacific	73	+ 4
Upper Mississippi Valley	85	+ 8			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I.	13	51	nw.	New York, N. Y.	7	61	nw.
Do	18	52	w.	Do	13	56	nw.
Do	26	52	nw.	North Head, Wash	7	60	nw.
Do	27	51	w.	Do	19	74	se.
Buffalo, N. Y	10	62	sw.	Do	20	60	s.
Do	13	54	w.	Do	21	66	se.
Do	14	55	w.	Do	22	70	se.
Do	17	58	w.	Tatoosh Island, Wash	1	70	e.
Cleveland, Ohio	17	50	w.	Do	2	56	e.
Mount Tamalpais, Cal	10	50	nw.	Do	7	64	nw.
Mount Weather, Va	3	50	nw.	Do	10	66	ne.
Do	7	50	nw.	Do	11	52	e.
Do	13	60	nw.	Do	16	60	e.
Do	15	52	nw.	Do	17	59	e.
Do	17	52	nw.	Do	19	52	sw.
Do	18	52	nw.	Do	21	62	e.
Do	26	54	nw.	Do	26	52	e.

CLEAR SKY AND CLOUDINESS.

The cloudiness was above normal in the Middle, South Atlantic, and Gulf States, Ohio Valley and Tennessee, the middle and southern Slope and Plateau and south Pacific regions; and below normal in the remaining districts.

The distribution of clear sky is graphically shown on Chart IV, and the numerical values of average daylight cloudiness, both for individual stations and by geographic districts, appear in Table I.

The average for the various districts, with departures from the normal, are shown in the following table:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.9	— 0.6	Missouri Valley	4.4	— 1.0
Middle Atlantic	5.8	+ 0.2	Northern Slope	3.7	— 1.1
South Atlantic	6.5	+ 1.2	Middle Slope	5.6	+ 1.2
Florida Peninsula	4.4	— 0.2	Southern Slope	6.2	+ 1.4
East Gulf	6.7	+ 1.2	Southern Plateau	6.2	+ 2.8
West Gulf	6.5	+ 0.7	Middle Plateau	5.9	+ 1.1
Ohio Valley and Tennessee	6.4	+ 0.2	Northern Plateau	5.1	— 1.6
Lower Lake	6.5	— 0.3	North Pacific	5.5	— 1.5
Upper Lake	5.8	— 0.5	Middle Pacific	4.6	— 0.2
North Dakota	3.5	— 1.6	South Pacific	5.6	+ 1.5
Upper Mississippi Valley	4.9	— 0.4			

DESCRIPTION OF TABLES AND CHARTS.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

For description of tables and charts see page 20 of REVIEW for January, 1905.

TABLE I.—*Climatological data for Weather Bureau stations, February, 1905.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.								Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.				
New England.							19.8	— 5.8									70	1.78	— 1.7								4.9		
Eastport	76	69	82	29.90	29.99	+ .01	16.0	— 6.0	38	13	24	— 3	19	8	29	15	11	80	2.77	— 0.9	12	10,796	w.	48	nw.	8	10	4	14	6.1	26.7
Portland, Me.	103	81	117	29.93	30.06	+ .04	18.4	— 6.2	39	21	27	— 1	12	10	31	15	9	68	1.78	— 1.7	7	7,194	nw.	37	nw.	7	12	6	10	4.6	12.0
Concord	288	70	79	29.75	30.08	+ .04	17.8	— 5.6	41	21	28	— 9	1	8	42	....	....	....	1.80	— 1.4	5	4,518	nw.	28	nw.	7	16	3	9	4.2	16.9
Northfield	876	16	60	29.11	30.11	+ .07	10.8	— 5.2	39	20	22	—19	5	— 1	45	8	3	73	0.73	— 1.6	8	5,726	n.	36	nw.	7	9	9	10	5.5	7.3
Boston	125	115	181	29.94	30.09	+ .05	23.4	— 4.6	43	21	31	3	4	16	29	20	12	63	1.59	— 1.9	6	8,524	w.	40	w.	18	13	4	11	4.9	8.0
Nantucket	12	14	90	30.06	30.07	+ .03	24.5	— 6.5	40	13	30	8	4	19	24	23	19	77	2.16	— 0.7	12	12,587	w.	48	ne.	22	8	8	12	6.4	7.6
Block Island	26	11	46	30.08	30.11	+ .05	24.6	— 6.2	43	13	31	7	4	18	27	22	16	70	1.39	— 3.0	8	14,946	nw.	52	w.	18	12	8	8	4.8	2.5
Providence	159	57	67	29.92	30.11	+ .06	22.6	.....	47	21	31	1	4	14	32	19	12	66	1.18	.....	6	5,857	w.	30	nw.	18	16	3	9	4.4	6.1
Hartford	159	115	132	29.96	30.14	+ .08	20.6	.....	44	21	29	— 5	5	12	31	17	11	67	1.79	.....	6	5,205	nw.	25	nw.	11	14	7	7	4.3	10.9
New Haven	106	116	154	30.02	30.14	+ .07	22.7	— 6.1	47	21	31	3	5	14	32	19	12	63	2.06	— 2.1	6	7,189	w.	36	nw.	7	16	5	7	3.8	6.8
Mid. Atlantic States.							25.4	— 3.4									74	2.50	— 0.8								5.8		
Albany	97	102	115	30.05	30.17	+ .10	17.6	— 6.6	41	21	26	— 8	14	9	27	15	10	73	0.80	— 1.9	6	5,505	nw.	25	nw.	18	9	12	7	5.2	7.8
Binghamton	875	79	90	29.19	30.17	+ .09	17.2	— 6.7	38	13	27	—14	5	8	39	....	....	....	0.57	— 2.3	11	5,038	w.	27	nw.	18	8	9	11	5.6	7.7
New York	314	108	350	29.80	30.16	+ .08	24.6	— 6.9	46	21	31	4	16	18	27	22	17	74	2.79	— 1.0	7	11,268	nw.	61	nw.	7	11	10	7	4.7	7.2
Harrisburg	374	94	104	29.79	30.21	+ .12	22.2	—10.3	46	21	30	— 3	14	14	27	19	14	72	1.15	— 1.6	7	5,661	nw.	33	nw.	13	9	8	11	5.8	10.2
Philadelphia	117	116	184	30.06	30.20	+ .10	26.3	— 7.2	45	26	33	6	16	20	25	24	18	71	2.56	— 0.6	9	7,808	nw.	34	nw.	7	12	6	10	5.3	7.9
Scranton	805	111	119	29.26	30.17	+ .09	20.7	.....	46	25	30	— 3	14	12	33	19	15	81	1.61	.....	16	5,655	sw.	30	nw.	10	6	7	15	6.6	15.0
Atlantic City	52	39	48	30.12	30.18	+ .07	25.6	— 8.3	46	12	33	3	3	18	29	23	18	73	3.67	+ 0.3	10	5,921	nw.	30	se.	12	10	6	12	5.5	1.7
Cape May	17	48	52	30.19	30.21	+ .10	27.0	— 8.7	44	12	33	5	5	21	28	25	....	....	3.43	— 0.4	9	6,866	nw.	36	se.	12	9	12	7	5.1	1.9
Baltimore	123	69	117	30.06	30.20	+ .09	27.3	— 8.9	49	21	34	5	16	20	23	23	16	63	2.40	— 1.1	10	5,399	nw.	34	w.	10	10	3	15	6.1	5.4
Washington	112	59	76	30.09	30.22	+ .11	26.4	— 9.4	49	25	34	4	5	19	27	22	15	65	2.55	— 0.8	11	5,086	nw.	30	nw.	7	8	7	13	5.8	5.5
Lynchburg	681	83	88	29.44	30.21	+ .10	30.1	— 9.9	50	28	37	6	14	23	28	27	22	75	2.47	— 1.1	7	2,942	nw.	26	nw.	13	8	7	13	6.1	4.6
Mount Weather	1,725	10	57	28.27	30.21	.....	20.8	.....	41	13	28	— 4	14	14	40	19	16	83	1.28	.....	11	13,246	nw.	60	nw.	13	9	10	9	5.8	9.1
Norfolk	91	102	111	30.10	30.20	+ .09	33.4	— 9.4	59	12	40	12	16	27	30	29	25	76	4.43	+ 0.6	12	6,263	n.	34	w.	12	7	6	15	6.7	2.4
Richmond	144	82	90	30.06	30.23	+ .12	31.2	.....	51	28	38	7	16	24	25	....	....	....	4.14	.....	12	3,460	n.	19	nw.	15	10	8	10	5.6	2.2
Wytheville	2,293	40	47	27.72	30.22	+ .10	26.8	— 8.3	48	21	34	— 5	14	19	38	23	20	82	3.22	— 0.2	12	4,517	w.	26	w.	17	7	6	15	6.4	4.1
S. Atlantic States.							40.3	— 3.6									76	4.90	+ 1.2								6.5		
Asheville	2,255	53	75	27.76	30.24	+ .11	31.0	— 9.1	54	24	39	— 6	14	23	37	27	24	80	3.49	— 0.2	9	6,526	nw.	34	nw.	25	7	4	17	6.9	6.5
Charlotte	773	68	76	29.35	30.22	+ .10	34.7	—10.3	60	28	42	8	14	27	28	30	24	72	5.38	+ 0.9	11	4,533	ne.	20	sw.	17	8	5	15	6.1	3.2
Hatteras	11	12	47	30.16	30.17	+ .06	38.4	— 8.2	58	20	45	18	16	32	24	35	33	84	3.73	— 0.7	10	10,768	ne.	43	s.	12	10	5	13	6.0	3.3
Raleigh	376	71	79	29.79	30.21	+ .10	34.2	— 9.7	55	25	42	9	14	27	29	30	22	66	6.05	+ 2.3	10	4,640	n.	24	nw.	28	8	5	15	6.1	3.6
Wilmington	78	82	90	30.08	30.17	+ .05	40.7	— 9.1	65	20	50	17	16	32	34	35	30	74	5.44	+ 2.2	12	5,721	nw.	29	sw.	13	7	12	9	5.9	
Charleston	48	14	92	30.14	30.18	+ .06	45.0	— 7.8	68	20	53	22	16	37	31	41	39	85	3.67	+ 0.4	11	7,572	nw.	35	e.	12	6	10	12	6.2	
Columbia, S. C.	351	167	175	29.80	30.19	+ .08	38.8	— 9.3	65	28	46	16	14	31	26	33	28	73	5.03	+ 0.8	13	6,435	ne.	31	w.	13	6	8	14	6.9	T.
Augusta	180	89	97	30.01	30.21	+ .09	40.6	— 9.8	65	28	49	12	14	32	30	36	32	77	7.04	+ 3.1	10	4,439	nw.	28	w.	25	8	8	12	6.2	
Savannah	65	81	89	30.12	30.19	+ .07	47.2	— 7.1	76	12	56	21	14	39	27	41	36	73	4.55	+ 1.5	12	5,653	ne.	28	nw.	13	4	5	19	7.6	
Jacksonville	43	101	129	30.10	30.15	+ .03	52.8	— 5.6	79	12	61	26	14	44	40	48	45	81	4.65	+ 1.5	9	6,568	ne.	39	sw.	13	7	5	16	6.7	
Florida Peninsula.							66.7	— 0.4									81	0.95	— 1.5								4.4		
Jupiter	28	10	48	30.09	30.12	+ .04	67.6	+ 0.5	85	13	74	43	16	61	25	62	59	82	1.50	— 1.2	10	8,095	n.	34	se.	20	6	16	6	5.0	
Key West	22	10	53	30.08	30.10	+ .03	70.8	— 0.6	83	13	76	55	16	66	19	65	63	80	0.30	— 1.3	6	6,871	ne.	27	e.	19	15	10	3	3.2	
Tampa	34	79	96	30.10	30.14	+ .04	61.6	— 1.2	82	20	71	34	16	52	30	55	52	80	1.05	— 2.0	7	5,720	ne.	27	nw.	13	12	8	8	4.9	
East Gulf States.							42.9	—10.3									78	7.03	+ 2.4								6.7		
Atlanta	1,174	196	216	28.93	30.21	+ .09	36.1	—11.9	63	27	43	2	14	29	36	32	28	78	3.12	— 1.5	12	8,935	nw.	46	nw.	13	6	8	14	6.7	0.7
Macon	370	93	99	29.79	30.20	+ .08	41.0	.....	66	25	49	10	14	33	35	....	....	....	7.69	.....	11	5,153	nw.	28	nw.	13	5	3	20	7.4	
Pensacola	56	79	96	30.13	30.19	+ .08	49.8	— 7.0	71	25	58	15	14	42	45	....	....	....	4.86	+ 1.0	9	7,284	n.	36	se.	8	8	4	16	6.5	T.
Birmingham	700	136	143	29.43	30.22	+ .10	38.4	—10.8	67	27	47	2	14	30	32	....	....	....	7.01	+ 2.8	11	5,759	nw.	36	se.	8	8	4	16	6.8	2.0
Mobile	57	88	96	30.12	30.19	+ .08	47.4	— 7.4	70	25	56	15	14	39	36	42	37	75	11.15	+ 6.4	10	5,375	n.	32	n.	13	6	8	14	6.8	T.
Montgomery	223	100	112	29.96	30.22	+ .10	43.0	— 9.7	69	27	51	10	14	35	37	39	36	82	6.28	+ 0.9	9	5,033	nw.	26	nw.	13	8	5	15	6.4	T.
Meridian	375	84	93	29.80	30.22	+ .11	39.4	—14.2	70	27	48	8	14	31	33	....	....	....	11.83	+ 6.2	10	4,074	ne.	22	nw.	13	7	5	16	6.7	0.7
Vicksburg	247	62	74	29.94	30.23	+ .13	40.4	—12.2	70	27	48	11	14	33	29	36	31	76	7.07	+ 2.4	11	4,764	ne.	31	nw.	13	5	6	17	7.1	2.3
New Orleans	51	88	121	30.12	30.18	+ .09	48.8	— 9.3	72	27	57	18	14	41	25	44	39	77	5.32	+ 0.8	10	6,359	ne.	30	n.	13	9	4	15	6.2	
West Gulf States.							39.9	—11.6									75	2.88	— 0.5								6.5		
Shreveport	249	77	84	29.98	30.26	+ .17	39.4	—11.8	72	23	47	6	13	31	34	34	29	72	4.12	0.0	12	4,990	nw.	24	nw.	12	9	4	15	6.5	3.0
Fort Smith	457	79	94	29.77	30.28	+ .18	31.5	—10.0	70	24	41	— 8	13	22	37	28	22	72	1.87	— 1.7	10	6,178	e.	32	nw.	27	5	11	12	6.4	15.0
Little Rock	357	93	100	29.89	30.28	+ .17	33.5	—11.9	71	24	42	0	13	26	33	29	23	69	1.92	— 3.4	11	6,276	nw.	31	nw.	25	8	6	14	6.5	9.9
Corpus Christi	20	48	53	30.18	30.20	+ .15	45.6	—13.4	70	25	52	18	13	39	36	43	41	87	2.91	+ 0.5	13	6,290	n.	36	nw.	13	4	9	15	6.9	T.
Fort Worth	670	106	114	29.54	30.29	+ .22	35.4	.....	75	24	45	1	13	26	34	....	....	....	1.93	.....	10	7,309	n.	32	nw.	12	7	8	13	6.5	T.
Galveston	54	106	112	30.14	30.20	+ .13	45.6	—11.4	67	25	51	17	13	40	35	43	40	86	5.23	+ 2.2	11	8,814	n.	42	n.	13	10	3	15	6.2	
Palestine	510	73	79	29.69	30.24	+ .16	40.0	—11.0	74	24	48	6	13	32	39	35	29	72	2.47	— 1.0	13	5,619	n.	28	n.	12	10	5	13	6.3	0.2
San Antonio	701	80	91	29.45	30.20	+ .15	43.9	—11.9	78	24	54	13	13	34	36	39	33	70	1.62	— 0.3	12	5,856	n.	32	n.	12	11	5	12	6.0	
Taylor	583	55	63	29.60	30.24	+ .18	40.0	.....	79	24	50	9	13	30	39	....	....	....	1.85	.....	8	7,074	n.	31	n.	12	3	11	14	7.1	0.3
Ohio Val. and Tenn.							26.9	—10.6									77	2.83	— 1.4								6.4		
Chattanooga	762	106	112	29.42	30.26	+ .13	34.6	—10.9	63	27	42	— 4	14	27	33	30	25	73	7.72	+ 2.4	15	5,044	nw.	31	n.	25	8	3	17	6.6	14.7
Knoxville	1,004	35	88	29.13	30.23	+ .11	32.3	—10.0	61	22	40	—10	14	25	34	29	24	77	5.68	+ 0.3	11	4,967	ne.	32	w.	25	7	5	16	6.6	9.0
Memphis	399	146	154	29.84	30.29	+ .18	33.0	—11.8	67	24	40	1	13	26	32	29	23	72	2.83	— 2.5	8	6,882	nw.	30	w.	14	8	3	17	6.4	10.3
Nashville	546	122	134	29.67	30.28	+ .16	30.8	—11.9	63	28	39	— 6	14	22	32	27	23	76	2.66	— 2.6	9	4,888	nw.	28	nw.	27	7	9	12	6.2	8.0
Lexington	989	75	102	29.13	30.26	+ .15	24.9	—11.3	51	28	33	— 7	14	17	30	....	....	....	2.13	— 1.6	14	7,547	w.	37	nw.	25	9	6	13	6.1	3.6
Louisville	525	114	136	29.67	30.28	+ .17	27.2	—11.0	57	24	35	— 5	13	20	28	25	20	77	2.23	— 2.1	11	6,167	sw.	30	w.	25	8	9	11	5.5	1.2
Evansville	431	72	82	29.78	30.28	+ .17	26.2	.....	59	28	34	—11	13	18	34	....	....	....	1.92	.....	9	5,444	nw.	36	s.	14	5	12	11	6.0	5.1
Indianapolis	822	154	164	29.32	30.25	+ .15	20.0	—12.3	47	28	28	—16	13	12	34	18	15	81	1.85	— 1.7	7	7,227	nw.	37	sw.	9	9	7	12	5.8	12.7
Cincinnati	628	152	160	29.55	30.26	+ .16	24.7	—11.7	46	28	32	— 5	13	17	29	22	18	73	1.76	— 1.9	10	5,669	w.	30	w.	17	9	4	15	6.4	5.4
Columbus	824	173	190	29.31	30.23	+ .14	22.0	—10.1	43	28	30	— 8	14	14	27	20	17	82	1.57	— 2.2	8	8,417	w.	48	sw.	17	8	7	13	6.4	5.2
Pittsburg	842	336	352	29.27	30.22	+ .13	24.6	— 8.8	44	12	34	— 7	14	16	39	21	16	76	1.41	— 1.4	13	7,674	nw.	39	w.	17	6	8	14	7.2	5.2
Parkersburg	638	77	84	29.54	30.23	+ .13	25.5	—10.8	45	12	33	— 6	3	18	31	23	18	75	1.75	— 1.9	10	4,097	nw.	26	nw.	17	8	6	14	6.4	5.3
Elkins	1,940	41	50	28.07	30.25	+ .15	23.6	— 7.0	47	9	33	—13	3	14	47	21	17	81	2.32	— 1.7	20	3,313	w.	24	s.	8	3	12	13	7.0	10.5
Lower Lake Region.							18.4	— 8.1									81	1.85	— 0.9								6.5		
Buffalo	767	178	206	29.28	30.16	+ .10	17.6	— 6.9	39	25	25	— 8	14	10	30	16	12	80	2.46	— 0.4	22	11,214	w.	62	sw.	10	2	14	12	7.0	18.6
Oswego	335	76	91	29.76	30.15	+ .09	17.0	— 7.6	41	20	25	—11	5	9	32	16	13	83	3.30	+ 0.8	17	8,733	nw.	37	nw.	18	2	11	15	7.4	33.0
Rochester	523	81	102	29.56	30.16	+ .10	18.3	— 6.1	42	25	26	— 6	14	10	34	16	13	81	1.91	— 0.8	17	7,695	w.	36	w.	17	4	10	14	7.0	15.2
Syracuse	597	97	113	29.49	30.16	+ .09	17.5	.....	40	20	25	— 7	5	10	35	....	....	....	1.78	.....	18	9,533	w.	40	s.	9	6	12	10	6.2	15.1
Erie	713	92	102	29.37	30.18	+ .11	19.8	— 7.7	40	25	27	— 9	14	13	32	18	14	81	1.27	— 2.2	19	7,800	w.	40	se.	8	6	7	15	6.9	8.7
Cleveland	762	190	201	29.34	30.20	+ .13	19.4	— 8.6	42	20	26	—10	14	12	33	17	12	73	1.70	— 1.2	17	10,582	sw.	50	w.	17	3	8	17	7.8	13.3
Sandusky	629	62	70	29.50	30.22	+ .15	19.0	— 9.9	41	20	26	—12	14	12	29	....	....	....	1.34	— 1.6	10	6,116	w.	29	w.	15	9	5	14	6.0	10.4
Toledo	628	120	127	29.49	30.21	+ .14	18.6	— 9.6	37	28	26	—14	14	11	29	17	14	82	1.32	— 0.7	11	7,671	sw.	36	w.	17	7	8	13	6.1	11.5
Detroit	730	153	193	29.35	30.19	+ .13	17.8	— 8.4	36	20	25	—15	14	11	29	16	14	86	1.50	— 0.8	10	8,307	sw.	37	e.	5	7	7	14	6.4	15.1
Upper Lake Region.							13.4	— 5.5									83	1.28	— 0.6								5.8		
Alpena	609	63	80	29.45	30.16	+ .13	12.8	— 5.2	40	20	21	—12	15	4	37	12	9	85	1.47	— 0.6	12	7,190	w.	36	e.	8	6	9	13	6.4	14.7
Escanaba	612	40	48	29.47	30.18	+ .12	12.1	— 3.7	46	20	21	—18	13	3	36	10	7	84	1.20	— 0.4	7	5,229	nw.	23	nw.	17	11	5	12	5.4	11.7
Grand Rapids	707	127	165	29.39	30.20	+ .15	17.7	— 5.7	40	25	24	—13	14	11	27	16	13	86	1.89	— 0.6	13	8,003	nw.	39	w.	17	5	7	16	6.8	18.8
Houghton	668	66	74	29.40	30.17	+ .12	10.2	.....	44	19	20	—24	4	1	62	....	....	....	1.19	.....	9	4,938	nw.	27	ne.	14	12	7	9	5.0	14.5
Marquette	734	76	116	29.32	30.17	+ .12	13.2	— 3.9	44	20	21	—16	13	6	36	10	6	78	0.79	— 1.0	14	7,954	nw.	34	sw.	13	8	8	12	6.2	8.1
Port Huron	638	70	120	29.47	30.20	+ .15	15.8	— 7.2	36	20	23	—15	14	8	35	14	12	85	0.81	— 1.6	10	8,199	sw.	39	w.	17	3	8	17	7.5	10.7
Sault Ste. Marie	614	40	61	29.42	30.16	+ .13	9.2	— 3.3	36	20	18	—20	15	1	44	8	5	82	0.75	— 0.6	10	6,556	nw.	38	w.	17	12	5	11	5.2	7.5
Chicago	823	241	274	29.30	30.24	+ .16	17.0	— 9.8	47	28	24	—18	13	10	28	16	13	85	1.95	— 0.3	10	12,065	nw.	47	sw.	27	9	8	11	5.4	14.1
Milwaukee	681	124	142	29.44	30.22	+ .16	15.8	— 6.9	40	25	23	—18	13	8	27	14	11	82	2.33	+ 0.5	10	8,749	w.	41	se.	8	9	6	13	5.6	21.1
Green Bay	617	49	86	29.49	30.20	+ .14	11.8	— 4.4	39	25	21	—22	13	3	30	10	5	76	1.17	— 0.6	6	7,024	sw.	35	n.	5	12	3	13	5.5	12.1
Duluth	1,133	11	47	28.90	30.20	+ .12	8.8	— 4.7	47	27	17	—29	13	0	34	6	4	84	0.42	— 0.7	4	9,029	nw.	48	nw.	1	12	8	8	4.8	4.9

TABLE I.—*Climatological data for Weather Bureau stations, February, 1905*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
North Dakota.							8.4	+ 1.2										78	0.29	— 0.3								3.5		
Moorhead	935	8	57	29.18	30.27	+ .16	9.6	+ 5.1	58	28	21	—30	12	— 1	49	7	5	87	0.18	— 0.6	5	6,088	nw.	31	se.	7	14	7	7	4.0	2.3
Bismarck	1,674	16	29	28.38	30.29	+ .17	7.4	— 2.1	55	22	18	—39	2	— 3	48	5	— 1	69	0.54	0.0	5	6,200	nw.	34	nw.	16	21	4	3	2.9	5.4
Devils Lake	1,482	11	44	28.55	30.24	+ .13	5.8	.....	52	23	18	—38	12	— 6	41	3	— 1	79	0.21	.....	4	7,570	w.	41	n.	9	15	8	5	3.7	2.3
Williston	1,875	14	44	28.12	30.22	+ .11	8.2	+ 0.5	58	28	20	—44	2	— 4	49	6	2	76	0.14	— 0.2	5	6,002	w.	41	nw.	8	16	6	6	3.4	1.0
Upper Miss. Valley.							16.9	— 0.2										85	1.24	— 0.6								4.0		
Minneapolis	.....	102	208	.....	.....	.....	11.9	— 4.3	56	28	20	—26	2	4	26	.....	.....	...	0.59	— 0.5	6	7,716	nw.	39	nw.	16	16	8	4	....	9.3
St. Paul	837	171	179	29.27	30.23	+ .14	11.8	— 4.0	56	28	20	—26	2	4	27	10	8	87	0.39	— 0.5	7	6,747	nw.	34	nw.	17	17	7	4	3.1	4.0
La Crosse	714	71	87	29.44	30.27	+ .19	12.6	— 7.5	48	28	21	—24	3	4	32	.....	.....	...	1.07	0.0	7	4,664	s.	27	n.	14	15	7	6	4.0	12.0
Madison	974	70	78	29.11	30.23	+ .16	11.4	.....	42	28	19	—24	13	4	25	10	8	87	1.29	— 0.3	6	7,133	nw.	32	sw.	27	14	7	7	4.1	12.2
Charles City	1,015	8	58	29.11	30.26	+ .16	8.8	.....	43	28	19	—31	2	— 2	41	8	7	97	1.16	+ 0.1	8	5,555	nw.	28	nw.	9	13	7	8	4.7	15.3
Davenport	606	71	79	29.57	30.27	+ .17	14.6	—10.7	52	28	23	—25	13	6	30	14	12	88	1.99	+ 0.4	8	5,663	w.	26	nw.	14	13	6	9	4.7	15.1
Des Moines	861	84	99	29.33	30.30	+ .19	14.8	— 8.3	63	28	24	—26	13	5	37	13	10	83	1.06	— 0.2	9	5,857	nw.	33	nw.	14	10	10	8	5.1	16.5
Dubuque	698	100	117	29.46	30.27	+ .18	13.4	— 9.2	49	28	22	—25	13	5	32	12	9	83	1.58	+ 0.1	7	4,785	nw.	24	nw.	14	12	8	8	4.8	16.6
Keokuk	614	63	78	29.57	30.29	+ .18	18.0	—10.3	62	28	27	—27	13	9	30	15	12	81	1.37	— 0.3	12	5,725	sw.	28	w.	9	14	4	10	4.7	13.3
Cairo	356	87	93	29.89	30.29	+ .17	28.2	—11.2	63	28	36	— 7	13	20	34	26	22	78	1.98	— 2.0	11	6,616	ne.	33	nw.	27	6	10	12	6.4	5.0
La Salle	536	56	64	29.67	30.28	+ .20	14.8	.....	46	28	24	—24	13	6	35	.....	.....	...	1.09	.....	7	6,085	w.	30	w.	9	13	5	10	5.0	13.3
Peoria	609	11	45	29.58	30.29	+ .19	15.2	.....	52	28	24	—26	13	6	42	.....	.....	...	1.45	.....	9	6,897	nw.	34	w.	9	11	6	11	5.2	12.8
Springfield, Ill.	644	82	93	29.55	30.28	+ .18	18.6	—11.7	59	28	27	—24	13	10	32	17	15	87	1.18	— 2.2	10	6,820	nw.	28	nw.	14	10	6	12	5.6	7.4
Hannibal	534	75	109	29.68	30.29	+ .18	18.2	—12.3	64	28	28	—25	13	9	34	.....	.....	...	1.39	— 0.6	13	6,620	sw.	32	sw.	14	10	7	11	5.6	15.0
St. Louis	567	208	217	29.64	30.28	+ .17	23.4	—11.7	61	28	32	—18	13	15	34	20	16	75	1.12	— 1.7	8	7,881	nw.	38	nw.	27	11	5	12	5.3	7.5
Missouri Valley.							16.6	— 7.9										80	1.05	— 0.2								4.4		
Columbia, Mo	784	11	84	29.41	30.29	+ .18	19.5	—15.7	63	28	29	—25	13	10	31	.....	.....	...	1.91	— 0.4	11	5,925	sw.	34	nw.	14	10	6	12	5.4	18.0
Kansas City	963	78	95	29.24	30.33	+ .22	21.2	— 9.8	67	28	30	—21	13	13	28	19	16	82	1.70	— 0.1	12	5,811	nw.	32	nw.	14	9	9	10	5.5	13.6
Springfield, Mo	1,324	98	104	28.81	30.29	+ .18	23.4	—11.3	63	26	32	—22	13	15	29	21	17	77	2.02	— 1.0	13	7,090	nw.	32	nw.	14	9	5	14	6.2	10.5
Topeka	.....	85	89	.....	.....	.....	20.4	—10.9	69	28	30	—22	13	11	32	.....	.....	...	1.74	+ 0.1	11	6,645	w.	37	nw.	14	11	8	9	5.0	14.0
Lincoln	1,189	75	84	28.96	30.30	+ .20	16.2	— 9.0	68	28	26	—26	13	6	39	14	11	81	0.85	— 0.1	11	7,053	n.	45	nw.	14	9	13	6	5.0	13.7
Omaha	1,105	115	121	29.05	30.31	+ .20	17.0	— 8.0	66	28	26	—25	2	8	30	14	11	81	1.36	+ 0.6	10	6,580	n.	38	nw.	14	9	10	9	5.0	16.5
Valentine	2,598	47	54	27.41	30.30	+ .21	13.4	— 8.1	62	28	26	—36	2	0	55	11	7	76	0.51	— 0.2	7	6,696	nw.	44	nw.	8	13	13	2	3.6	4.9
Sioux City	1,135	96	164	29.00	30.30	+ .18	13.6	— 5.4	64	28	24	—30	2	3	43	.....	.....	...	0.44	— 0.1	8	8,356	nw.	49	nw.	14	13	9	6	4.1	8.9
Pierre	1,572	43	50	28.54	30.31	+ .20	14.4	— 1.0	66	28	26	—40	2	3	53	11	6	74	0.17	— 0.2	5	4,736	nw.	37	w.	14	15	8	5	3.9	2.0
Huron	1,306	56	67	28.82	30.31	+ .19	10.2	— 1.8	63	28	23	—36	2	—3	58	8	5	87	0.27	— 0.3	8	7,212	nw.	38	se.	7	17	4	7	4.0	2.9
Yankton	1,233	55	65	28.91	30.32	+ .20	13.8	— 5.4	66	28	26	—33	2	2	55	.....	.....	...	0.53	— 0.2	8	5,497	nw.	46	nw.	14	12	6	10	5.1	6.1
Northern Slope.							16.6	— 4.4										75	0.31	— 0.3								3.7		
Havre	2,505	11	44	27.44	30.23	+ .16	11.2	— 2.0	63	28	24	—48	2	— 1	46	8	4	78	0.14	— 0.4	3	6,421	nw.	36	nw.	25	16	11	1	3.1	1.4
Miles City	2,371	42	50	27.58	30.28	+ .19	14.8	— 1.4	64	28	28	—40	2	2	46	11	9	89	0.14	— 0.4	5	3,460	n.	40	nw.	8	.....	.....	.....	.....	1.0
Helena	4,110	8	56	25.86	30.25	+ .14	18.2	— 3.5	62	25	28	—30	12	8	34	14	9	71	0.27	— 0.5	3	3,737	sw.	40	w.	8	14	6	8	4.0	3.5
Kalispell	2,962	11	34	27.02	30.23	+ .15	18.2	.....	53	25	29	—28	11	8	34	16	12	79	1.21	.....	11	2,661	w.	24	n.	9	15	7	6	4.0	11.3
Rapid City	3,234	46	50	26.67	30.28	+ .20	18.4	— 2.2	65	28	30	—29	12	6	55	13	8	73	0.02	— 0.6	2	4,863	nw.	34	nw.	14	22	1	5	2.4	0.2
Cheyenne	6,088	56	64	23.97	30.21	+ .18	20.2	— 7.1	63	28	31	—30	12	9	38	16	9	66	0.69	+ 0.3	10	6,955	nw.	38	nw.	14	10	13	5	4.7	12.8
Lander	5,372	26	36	24.64	30.23	+ .15	18.3	— 4.7	60	23	34	—30	12	3	47	14	10	74	0.24	— 0.5	3	1,831	ne.	30	sw.	20	17	5	6	3.8	2.4
Yellowstone Park	6,200	11	47	23.85	30.24	+ .14	17.0	.....	50	22	29	—36	12	5	39	12	5	64	0.60	.....	6	4,746	s.	27	nw.	8	16	11	1	3.0	7.5
North Platte	2,821	43	52	27.22	30.32	+ .25	15.2	—10.1	67	28	27	—27	6	3	54	12	8	79	0.69	+ 0.3	8	5,316	w.	30	nw.	8	13	8	7	4.4	10.4
Middle Slope.							23.4	— 9.0										76	0.77	0.0								5.6		
Denver	5,291	129	136	24.72	30.17	+ .16	25.2	— 7.0	62	28	37	—21	12	14	52	29	13	65	0.35	— 0.2	6	4,821	s.	40	w.	8	8	12	8	5.6	6.7
Pueblo	4,685	80	86	25.32	30.20	+ .20	23.9	— 6.2	65	23	36	—26	13	12	57	19	14	70	0.92	+ 0.5	10	4,021	nw.	36	nw.	8	8	14	6	5.3	9.0
Concordia	1,398	42	47	28.77	30.33	+ .24	19.4	— 8.8	69	28	28	—21	13	10	35	16	12	80	0.80	0.0	8	4,708	s.	28	nw.	14	10	8	10	5.4	8.0
Dodge	2,509	44	54	27.57	30.31	+ .25	21.4	—10.4	65	28	31	—20	13	12	40	19	16	84	0.61	0.0	11	6,853	nw.	32	n.	11	9	4	15	6.0	6.1
Wichita	1,358	78	86	28.82	30.33	+ .25	23.2	— 8.6	66	26	32	—18	13	14	33	20	16	79	0.64	— 0.6	11	6,479	s.	36	n.	14	10	7	11	5.6	8.3
Oklahoma	1,214	79	86	28.94	30.29	+ .22	27.4	—13.1	65	26	36	—11	13	19	33	24	21	81	1.31	+ 0.4	9	7,298	n.	36	s.	16	7	8	13	6.0	11.4
Southern Slope.							30.0	—11.6										77	1.27	+ 0.1								6.2		
Abilene	1,738	45	54	28.36	30.24	+ .19	34.0	—11.9	74	26	44	1	12	24	49	28	22	68	1.02	— 0.4	8	5,489	n.	27	w.	14	7	7	14	6.9	10.8
Amarillo	3,676	10	49	26.34	30.23	+ .21	23.9	—11.7	62	26	34	—15	13	14	39	22	19	85	1.52	+ 0.6	9	7,733	n.	30	s.	15	12	7	9	4.9	18.7
Roswell	3,578	9	57	26.46	30.22	+ .24	30.7	.....	71	24	42	—29	13	19	47	28	24	78	2.62	.....	11	3,502	s.	27	n.	11	4	11	13	6.7	23.3
Southern Plateau.							44.8	0.0										69	3.01	+ 2.0								6.2		
El Paso	3,762	10	110	26.24	30.06	+ .11	47.3	— 2.1	73	1	58	22	7	37	34	40	32	63	1.88	+ 1.5	9	7,119	ne.	44	sw.	11	3	11	14	7.1	6.9
Santa Fe	7,013	33	39	23.21	30.08	+ .10	30.7	— 1.3	52	26	39	— 3	13	22	28	27	23	76	1.60	+ 0.8	15	4,435	nw.	32	nw.	8	10	7	11	5.9	8.7
Flagstaff	6,907	12	25	23.28	29.96	— .04	30.0	— 1.4	50	25	38	—18	13	22	47	29	27	86	5.79	+ 2.5	16	4,029	sw.	30	sw.	11	3	4	19	7.8	25.6
Phoenix	1,108	50	56	28.81	29.97	— .02	56.4	+ 2.0	78	25	65	28	13	48	34	50	45	71	4.64	+ 3.9	14	2,757	e.	20	s.	5	6	7	15	6.5	0.0
Yuma	141	16	46	29.82	29.97	— .03	59.4	+ 0.8	79	25	67	37	13	52	22	52	46	67	3.43	+ 2.9	12	3,983	n.	36	n.	12	8	12	8	4.7	0.0
Independence	3,910	11	42	25.95	29.96	— .10	45.0	+ 2.2	70	23	55	18	13	35	32	37	27	53	0.73	+ 0.2	8	4,846	se.	34	n.	6	13	3	12	5.0	0.0
Middle Plateau.							33.7	+ 1.2										73	1.26	+ 0.1								5.9		
Carson City	4,729	82	92	25.24	30.03	— .05	35.8	— 0.7	64	28	47	7	12	24	37	32	27	74	1.09	— 0.4	5	2,808	e.	40	sw.	10	12	7	9	4.9	10.1
Winnemucca	4,344	18	56	25.61	30.07	— .02	35.6	+ 3.1	65	27	48	— 4	12	23	40	31	25	69	0.84	— 0.1	6	4,251	ne.	25	sw.	19	11	5	12	5.1	4.0
Modena	5,479	10	43	24.57	30.00	— .04	33.0	+ 3.7	58	26	42	—10	13	25	30	30	25	71	1.79	+ 0.2	10	5,029	w.	34	w.	10	5	11	12	6.2	3.3
Salt Lake City	4,366	105	110	25.64	30.10	+ .02	34.2	+ 1.3	58	21	42	— 4	12	26	25	30	24	67	1.22	— 0.1	10	3,251	se.	45	nw.	8	9	9	10	5.6	2.6
Durango	6,546	18	56	23.60	30.16	+ .16	28.2	.....	52	25	37	—17	13	19	35	25	22	79	4.38	.....	17	2,969	s.	24	w.	8	5	3	20	7.5	36.7
Grand Junction	4,608	43	51	25.42	30.10	+ .06	29.7	— 1.6	56	27	38	—14	14	21	33	27	23	78	1.37	+ 0.8	9	2,501	se.	24	nw.	8	7	9	12	6.2	14.8
Northern Plateau.							31.4	+ 0.3										72	0.65	— 1.0								6.1		
Baker City	3,471	53	59	26.80	30.18	+ .06	29.6	+ 4.6	56	25	38	—12	12	21	26	26	21	72	0.43	— 1.3	7	4,004	se.	22	nw.	10	6	14	8	5.4	2.1
Boise	2,739	61	68	27.26	30.20	+ .08	33.8	— 0.8	62	27	43	— 2	12	24	29	29	23	66	0.43	— 1.2	4	2,364	se.	19	e.	19	12	6	10	5.2	3.5
Lewiston	757	10	51	29.35	30.19	+ .08	34.2	— 4.3	61	26	43	—10	11	25	30	.....	.....	...	0.78	— 0.5	7	2,510	e.	46	w.	7	10	8	10	5.4	3.8
Pocatello	4,483	46	54	25.47	30.19	+ .09	26.0	+ 3.0	56	25	37	—20	12	16	37	23	18	72	0.76	— 1.1	6	5,123	e.	34	sw.	8	18	6	4	3.4	5.7
Spokane	1,929	101	110	28.08	30.20	+ .11	29.8	+ 1.3	57	27	39	— 7	11	21	29	27	21	69	0.55	— 1.4	8	3,462	ne.	36	w.	7	10	0	18	6.1	1.5
Walla Walla	1,000	71	79	29.08	30.18	+ .07	34.8	— 0.6	66	24	42	— 3	12	27	29	33	30	83	0.96	— 0.4	6	3,412	s.	34	sw.	7	9	14	5	5.0	2.6
N. Pac. Coast Reg.							42.0	+ 2.3										74	3.35	+ 2.3								5.5		
North Head	211	11	56	29.80	30.03	— .03	44.6	+ 2.9	71	26	50	19	11	39	25	42	39	83	4.64	— 1.6	12	12,063	e.	74	se.	19	11	4	13	5.6	
Port Crescent	259	12	29	29.75	30.04	+ .01	38.8	+ 1.0	56	21	45	16	11	33	21	.....	.....	...	3.85	— 0.8	12	4,312	e.	40	ne.	10	8	8	12	5.5	0.2
Seattle	123	114	151	29.95	30.08	+ .02	43.3	+ 1.9	66	26	50	20	11	37	28	40	34	70	2.76	— 0.9	11	3,062	e.	28	nw.	10	11	4	13	4.9	T.
Tacoma	213	113	120	29.82	30.05	— .01	42.2	+ 3.3	66	26	50	17	12	35	30	.....	.....	...	2.51	— 2.8	14	3,964	n.	42	e.	10	10	10	8	5.6	T.
Tatoosh Island	86	7	87	29.90	30.00	— .00	43.9	+ 3.1	55	25	48	29	11	40	11	41	36	76	6.96	— 1.5	17	16,992	e.	70	e.	1	11	5	12	5.5	
Portland, Oreg.	153	68	96	29.91	30.07	— .01	42.6	+ 1.4	68	26	49	17	11	36	23	37	29	61	1.77	— 4.4	11	5,529	e.	34	ne.	16	11	3	14	5.4	0.1
Roseburg	518	56	60	29.46	30.03	— .07	44.6	+ 2.5	68	28	54	17	12	36	34	41	38	78	0.98	— 4.0	12	1,745	nw.	18	sw.	19	8	8	12	6.1	0.2
Mid. Pac. Coast Reg.							52.2	+ 3.0										76	2.33	— 1.9								4.6		
Eureka	62	62	80	29.94	30.01	— .10	50.2	+ 3.8	66	21	56	31	12	44	23	47	44	80	0.99	— 5.5	7	4,161	se.	37	n.	6	8	11	9	5.3	0.0
Mount Tamalpais	2,375	11	18	27.49	29.98	— .12	47.7	.....	68	28	52	31	12	43	15	44	40	78	4.70	.....	9	11,861	nw.	50	nw.	10	11	8	9	5.1	0.0
Red Bluff	332	50	56	29.63	29.99	— .12	52.6	+ 3.6	80	25	63	29	13	42	33	46	39	66	3.17	— 0.5	8	4,000	n.	35	n.	6	18	4	6	3.5	0.0
Sacramento	69	106	117	29.91	29.98	— .11	52.2	+ 2.4	72	26	59	36	14	45	23	48	45	78	2.47	— 0.7	7	5,097	se.	37	se.	1	11	8	9	4.9	0.0
San Francisco	155	161	167	29.84	30.01	— .09	54.0	+ 2.3	71	28	60	42	13	48	22	50	46	77	2.70	— 1.0	8	4,311	w.	28	se.	5	14	7	7	4.4	0.0
S. Pac. Coast Reg.							56.7	+ 3.2										73	5.09	+ 2.4								5.6		
Fresno	330	67	70	29.62	29.98	— .10	53.6	+ 3.4	77	28	63	29	12	44	29	49	44	74	0.90	— 0.3	4	2,776	nw.	19	s.	5	13	3	12	5.1	
Los Angeles	338	116	123	29.60	29.96	— .10	58.3	+ 3.9	80	28	67	36	13	50	29	52	47	70	6.06	+ 2.8	11	3,720	ne.	24	se.	3	6	10	12	6.1	
San Diego	87	94	102	29.86	29.94	— .12	59.0	+ 4.2	79	28	65	40	13	53	26	53	49	75	5.90	+ 3.6	12	4,167	e.	35	se.	2	12	2	14	5.9	
San Luis Obispo	201	47	54	29.75	29.97	— .14	55.8	+ 1.5	79	27	65	34	13	46	32	51	46	73	7.51	+ 3.7	10	3,096	n.	24	n.	6	9	10	9	5.1	
West Indies.																														
Grand Turk	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Havana	57	87	105	30.03	30.09	+ .05	71.8	— 0.2	85	13	79	58	24	65	21	.....	.....	...	0.29	— 2.0	2	7,099	e.	36	ne.	19	20	3	5	2.9	
San Juan	82	48	90	29.96	30.05	.00	75.0	— 0.2	85	23	81	67	23	69	18	69	67	79	2.46	+ 0.1	23	7,990	e.	34	e.	20	10	17	1	4.4	

TABLE II.—*Climatological record of cooperative observers, February, 1905.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Alaga				6.08	
Anniston	66	— 4	33.0	5.77	3.5
Ashville	66	— 2	36.4	7.44	1.5
Benton				8.66	
Bermuda	72	10	44.0	8.33	
Boligee	71	5	40.2	10.34	1.2
Bridgeport				8.80	7.3
Burkeville				7.60	
Calera				5.72	1.5
Citronelle	72	11	47.6	10.15	
Cordova	70	— 5	37.4	7.01	4.5
Dadeville				6.67	
Daphne	75	12	48.4	11.17	
Decatur	66	— 3	35.4	7.35	8.0
Demopolis				8.20	
Eufaula	66	11	42.2	10.17	T.
Evergreen	70	13	45.6	3.86	
Flomaton	72	13	46.8	10.01	
Florence *b*	66	—13	33.8	6.19	8.9
Fort Deposit	60	9	38.8	6.26	
Gadsden	68	— 1	35.8	7.62	T.
Goodwater	67	1	37.3	6.56	0.1
Greensboro	69	4	40.4	7.20	1.0
Greenville				7.02	
Guntersville				7.64	5.2
Hamilton	69	—15	35.4	5.15	
Highland Home	72	9	43.2	6.95	T.
Letohatchie				5.24	
Livingston	74	7	39.2	7.85	
Lock No. 4	69	1	38.2	5.69	2.0
Lucy	77	15	49.5	5.92	
Madison Station	67	—10	35.2	8.09	6.5
Maplegrove	66	— 3	35.3	7.62	5.0
Marion	69	5	39.4	6.85	T.
Milstead				6.60	T.
Newbern	70	3	40.2	6.79	1.2
Notasulga				3.48	
Oneonta	67	—11	35.0	6.97	2.5
Opelika	66	17	42.5	6.31	T.
Ozark	69	11	45.6	8.18	
Prattville	70	8	42.0	6.88	T.
Riverton	69	—11	34.0	5.59	8.1
Scottsboro	67	—16	35.1	10.71	4.6
Selma	71	9	41.8	6.94	0.3
Spring Hill	67[1]	17[d]	48.6[e]	12.64	
Talladega	69	— 5	40.7	7.17	2.0
Tallassee				6.07	
Thomasville	69	9	39.7	8.05	
Tuscaloosa	70	2	37.0	9.31	1.5
Tuscumbia	63	— 8	32.8	5.66	3.1
Tuskegee	69	8	42.8	7.27	
Union Springs	69	9	39.5	8.32	T.
Uniontown	72	3	39.8	6.90	0.1
Valleyhead	65	—18	34.0	7.39	8.0
Verbena				5.24	
Vienna				10.62	
Wetumpka	71	8	42.6	7.38	
Alaska.					
Chestochena	38	—29	5.0	0.02	0.2
Junea	51	14	33.8	3.08	9.3
Kenai	39	—17	16.0	0.29	1.0
Ketchemstock	10	—52	—16.6	0.90	1.5
Killisnoo	50	14	32.4	2.80	7.0
Orca	45	22	33.6	11.56	8.0
Sitka	53	20	37.2	4.78	
Tanana		—41		0.08	1.5
Arizona.					
Allaire Ranch				3.77	3.0
Alpine				5.88	32.9
Arizona Canal Co. Dam	83	32	57.7	3.83	
Aztec	85	30	53.8	4.25	
Benson	72	25	50.4	3.34	1.0
Bisbee	65	26	45.5	5.71	5.0
Blue	65	8	39.3	5.14	11.5
Bowie	70	23	48.6	3.29	
Buckeye	78	24	56.1	6.46	
Casagrande	80	25	55.1	4.99	
Cochise[1]	64	24	46.5	3.20	T.
Congress	71	29	49.8	7.16	
Douglas	74	28	50.2	2.69	T.
Dragoon[1]	56	30	41.6		
Dudleyville	79	24	53.7	5.88	
Duncan	75	15	46.6	3.72	2.5
Fort Apache	70	6	43.8	4.31	4.0
Fort Defiance	51	—16	28.8	3.62	2.7
Fort Grant	70	20	48.0	2.34	5.0
Fort Huachuca	73	25	49.1	3.90	7.5
Fort Mohave	81	30	56.2	3.74	
Greaterville	66	21	46.0	3.76	12.0
Greer				3.00	24.0
Huachuca Reservoir				6.75	14.0
Holbrook	62	5	39.9	2.98	8.5
Jerome	64	16	43.3	7.80	T.
Kingman	69	12	46.4	4.47	T.
Maricopa	78	28	56.0	2.70	
Mesa	83	31	56.2	4.86	
Mohawk Summit[1]	75	45	61.9	2.30	
Natural Bridge				10.74	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Oracle	67	21	48.0	5.25	4.0
Oro				6.22	0.3
Parker	84	19	57.2	3.67	
Phoenix	80	24	53.8	4.38	
Picacho[1]	85	29	60.9	2.99	
Pinal Ranch				13.38	3.7
Prescott	54	0	31.4	7.92	
San Carlos	75	26	51.4	5.03	
San Simon	77	22	54.2	2.34	
Seligman	64	8	41.5	3.27	5.5
Sentinel[1]	80	31	58.4		
Showlow				9.12	18.0
Superstition				8.75	
Taylor	59	0	37.4	2.80	7.0
Tempe	82	25	55.4	4.64	
Thatcher	73	21	50.7	2.85	
Tombstone	68	23	47.2	3.84	6.0
Tuba	57	— 3	32.4	1.21	
Tucson	70	28	50.6	4.15	
Upper San Pedro	73[4]	23[4]	49.0[4]	2.00	T.
Vail[5]	78	33	57.9	2.61	3.0
Walnut Grove				7.60	
Wilcox	65	23	46.6	3.91	2.0
Williams	55	— 5	35.0	6.72	24.0
Yarnell				10.86	12.0
Young	71	10	46.5	7.94	
Arkansas.					
Amity	80	— 2	35.8	3.15	10.6
Arkadelphia	74	2	35.5	2.83	2.0
Arkansas City				4.56	3.0
Batesville	68	— 7	31.7	2.35	9.0
Beebranch	71	0	31.8	1.00	10.0
Black Rock				2.06	
Blanchard Springs	70	— 3	36.4	3.92	
Calico Rock				2.00	11.0
Camden *b*				3.98	
Clarendon				2.52	5.5
Conway	76	— 1	33.8	2.63	7.5
Corning	66	— 6	28.2	2.00	7.1
Dallas	71	— 6	33.9	2.60	4.0
Dardanelle				1.54	5.0
Des Arc	71	— 1	34.1	2.54	9.0
Dodd City	67	—16	27.0	1.70	17.0
Dutton	63	—17	27.2	2.03	13.9
Eldorado	74	2	36.3	4.52	
Elon	73	0	38.0	5.71	4.0
Eureka Springs	66	—16	27.4	2.80	13.0
Fayetteville	65	—18	25.6	1.89	12.5
Forrest City	71	0	31.7	1.38	11.0
Fulton				2.30	18.0
Hardy	68	—11	29.2	1.78	13.0
Heber	74	— 4	33.2	1.60	10.0
Helena *b*	70	2	34.0	3.19	
Hope	74	2	37.4	3.09	
Howe	74	0	36.4	3.69	
Jonesboro	75	— 4	30.4	1.93	7.5
Lacrosse	66	—12	26.1	2.50	12.5
Lake Village	71	2	35.4	2.70	
Lonoke	72	0	34.0		
Lutherville	74	— 9	31.0	2.05	10.0
Luxora				1.00	4.0
Malvern	73	— 1	33.8	2.25	
Mammoth Springs	60	—12	25.8	2.30	12.5
Marked Tree				1.81	8.0
Marvell	71	0	33.8	2.68	4.2
Mossville	61	—16	26.3	1.85	15.0
Mount Nebo	66	—11	32.0	2.07	8.0
New Lewisville	80	3	35.9	2.20	4.0
Newport *b*	67	4	31.2	1.99	3.8
Oregon	68	—20	26.3	1.84	10.0
Ozark	71	— 8	31.7	2.42	13.2
Perry	70	— 2	33.1	4.60	8.5
Pinebluff	73	2	33.2	4.20	5.0
Pocahontas	68	0	29.9	1.38	4.2
Pond	66	—29	26.2	1.60	9.5
Prescott	74	3	35.2	3.94	
Russellville	70	— 4	29.1	1.30	8.2
Silversprings	66	—19	28.0	1.91	15.5
Spielerville	72	— 7	32.1	1.84	10.2
Springbank				2.74	1.0
Stuttgart	72	1	33.8	3.08	5.3
Texarkana	82	0	34.7	3.53	
Warren	73	2	35.1	3.43	
Wiggs	73	— 3	33.4	2.74	2.8
Winchester	70	3	34.1		
Witts Springs	59[d]	—14[b]	25.8[e]	3.28	9.0
California.					
Alturas				1.31	4.0
Angiola	75	24	52.2	1.01	
Auburn	75	30	50.4	4.85	
Azusa	80	31	56.6	10.58	
Bagdad	76	35	57.7	3.20	
Bakersfield	81	28	54.6	1.46	
Barstow	75	38	55.2	0.50	
Bear Valley				7.25	16.0
Berkeley	69	29	50.6	2.56	
Bishop	75	12	43.9	1.18	
Blue Canyon	67	10	41.2	7.56	17.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bodie	55	—27	21.8	1.55	16.0
Bowman				8.97	34.0
Branscomb	78	21	48.2	4.38	T.
Brush Creek	74	22	45.2	8.85	1.0
Butte Valley				6.75	5.0
Calexico	75	31	57.2	3.76	
Cambria				7.12	
Campbell	72	27	51.4	3.76	
Campo				11.94	
Cedarville	65	— 5	34.2	1.12	8.0
Chico	78	26	52.6	4.85	
Claremont	74[j]	30[j]	50.4[j]	6.82	
Cloverdale	80	24	52.7	6.02	
Colfax	73	29	49.0	6.11	3.0
Colusa	75	29	51.2	2.59	
Craftonville				8.13	
Crescent City	64	29	49.4	2.47	
Crockers				7.60	6.0
Cuyamaca	52	16	36.8	15.91	10.0
Delta	83	29	52.0	6.89	
Dobbins	81	32	54.8	6.60	
Drytown	72	25	50.7	4.95	
Durham	79	21	50.6	4.36	
Elcajon	76	30	57.2	9.22	
Electra	75	30	54.3	4.35	
Elsinore	76	30	54.9	7.72	
Emigrant Gap	64	14	40.0	5.90	27.0
Escondido	81	21	54.0	9.29	
Folsom	75	25	52.6	2.88	
Fordyce Dam				8.85	61.0
Fort Bragg				1.68	
Fort Ross	65	33	51.2	6.56	
Foster				9.67	
Georgetown	71	26	47.7	6.46	
Gilroy (near)	80	25	52.5	4.30	
Glens Ranch				13.14	
Greenville	69	7	39.9	3.40	T.
Hanford	81	27	53.2	1.09	
Healdsburg	83	25	53.0	6.43	
Hollister	77	26	52.4	3.12	
Indio	78	38	57.0	2.00	
Idylwild	62	18	40.9	8.43	20.0
Imperial	81	22	56.4	6.12	
Iowa Hill	75	25	49.2	5.74	1.2
Irvine				6.38	
Isabella	75	26	49.8	2.99	
Jamestown	80	24	52.1	4.35	
Jolon				6.24	
Kennedy Gold Mine				4.48	
Kentfield				7.22	
Kernville				3.15	
King City	82	26	54.2	3.77	
Laytonville				3.48	
Le Grand	82	28	52.1	2.31	
Lemoncove	78	30	55.3	3.01	
Lick Observatory	64	23	43.1	4.19	3.5
Livermore	79	24	51.6	2.30	
Lodi	72	29	50.6	2.86	
Lone Pine	71	14	45.6	0.86	
Los Gatos	71	31	51.4	5.86	
Lowe Observatory				12.53	
Magalia	80	26	49.4	9.74	T.
Mammoth	80	32	58.2	3.45	
Marysville	76	29	51.8	2.80	
Meadow Valley				5.85	23.0
Merced	77	27	52.8	1.55	
Mercury				6.34	
Mills College				3.62	
Milo				3.00	
Milton (near)	70	28	52.4	2.07	
Mohave	72	22	48.4	1.60	T.
Mokelumne Hill				3.98	
Montague	73	13	42.8	0.33	T.
Monterio	70	24	47.6	4.66	
Monumental	76	20	48.6	3.60	T.
Mount St. Helena				5.90	
Napa	75	29	51.6	2.77	
Needles	79	26	58.6	4.50	
Nellie				15.09	8.0
Nevada City	77	17	46.4	6.75	1.0
Newcastle	74	31	54.6	3.80	
Newman	74	29	52.0	2.85	
Niles	74	32	52.7	3.21	
Ninshew				8.72	
Nordhoff	76	22	47.1	14.01	5.0
North Bloomfield	77	21	45.6	7.05	4.0
Oakland	68	38	53.0	3.90	
Ontario (near)	79	31	55.6	6.49	
Orland	78	30	52.6	2.82	
Orleans	83	24	53.4	1.90	
Oroville (near)	80	25	51.8	3.49	
Palermo	78	25	50.7	3.96	
Peachland	75	25	50.8	5.43	
Pilot Creek				7.18	8.5
Pine Crest	74	39	55.8	10.08	
Placerville	68	18	45.4	5.23	
Point Lobos	69	45	57.8	3.73	
Point Reyes Light	67	39	53.2	4.01	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Poway	79	33	58.8	7.99	
Quincy	63	14	40.0	4.44	T.
Redding	79	30	52.0	5.46	
Reedley	80	29	54.2	1.29	
Represa				2.84	
Riovista	72	30	50.8	2.72	
Riverside	83	27	55.7	5.86	
Rocklin	75	24	51.9	2.99	
Rohnerville				1.96	
Sacramento	71	32	51.2	3.00	
Salinas	77	29	54.2	1.62	
Salton	82	30	59.2	2.23	
San Bernardino	81	24	55.4	6.58	
San Jacinto				6.48	
San Jose	76	29	53.7	2.65	
San Leandro	72	28	51.2	3.27	
San Miguel Island				6.54	
San Rafael	74	30	52.9	5.43	
Santa Barbara	76	37	56.8	8.22	
Santa Clara College	76	26	54.0	3.16	
Santa Cruz	79	27	52.8	4.65	
Santa Maria	81	34	56.3	5.83	
Santa Monica				6.48	
Santa Rosa	75	23	50.4	4.26	
Sausalito				4.33	
Shasta	84	25	52.1	5.73	
Sierra Madre	75	34	56.4	11.82	
Sisquoc Ranch				6.63	
Sisson	66	7	39.0	3.96	2.0
Suedden				7.50	6.0
Sonoma	76	32	52.4	3.45	
Sonora	68	28	48.8	4.66	
Southeast Farallon	62	44	53.8	3.34	
Sterling				3.86	3.0
Stockton	60	29	48.0	2.38	
Storey	76	27	51.0	1.40	
Summerdale	64	17	40.2	9.50	14.0
Summit	45	0	30.8	7.00	64.0
Susanville	61	1	35.6	2.46	5.0
Tejon	76	30	54.2	2.45	
Truckee	56	−18	30.1	2.40	24.0
Tulare	80	28	54.8	1.25	
Tustin				5.49	
Ukiah	79	23	50.2	3.33	
Upland	74	30	52.0	7.92	
Upperlake				3.18	
Upper Mattole				4.91	
Vacaville	78	26	51.7	2.23	
Ventura	72	40	55.4	8.76	
Visalia	81	25	53.1	1.48	
Volcano	82	27	58.2	2.33	
Wasco	75	25	53.8	1.30	
Wasioja				5.59	
Weldon				2.52	
Westpoint				4.52	
West Saticoy				7.96	
Wheatland	72	27	49.9	2.64	
Willets				3.58	
Willows	78	27	52.4	2.87	
Woodside	69	28	51.0	5.48	
Yosemite	68	13	41.2	5.30	17,0
Zenia	72	23	45.8	3.64	
Colorado.					
Akron				0.32	5.0
Alford	61	−32	21.8	0.29	6.0
Antelope Springs	50	−31	18.2	1.70	21.5
Ashcroft	48	−31	18.3	1.83	26.5
Blaine	64	−18	23.0	0.27	4.0
Boulder	65	−20	27.0	0.70	8.5
Boxelder				0.23	4.0
Breckenridge	50	−30	18.2	2.92	42.0
Burlington	64[d]	−20[d]	20.7[d]	0.18	3.0
Canyon	67	−30	26.4	0.60	9.0
Cheesman	61	−30	25.2	0.47	4.8
Cheyenne Wells	82	−17	19.4	0.35	4.0
Clearview	52	−16	25.4	0.57	9.0
Colorado Springs	59	−23	23.4	0.87	9.6
Conejos	46	−25	21.2	1.33	11.5
Cripplecreek				0.57	9.3
Eagle	51	−33	21.2	1.38	18.0
Fort Collins	66	−27	21.8	0.35	5.6
Fort Morgan	62	−27	23.4	0.10	2.0
Fowler				0.36	5.0
Fox	66	−24	21.0	0.19	3.0
Frances	58	−23	24.5	1.99	26.5
Fruita	55	−29	27.8	1.59	11.2
Garnett	46	−33	16.8	0.35	5.5
Gleneyre	65	−28	22.0	1.00	10.5
Glenwood Springs	52	−30	23.0	1.45	32.0
Grand Valley	55	−22	28.8	3.65	18.5
Greeley	65	−28	21.6	0.15	4.2
Grover				0.26	4.0
Gunnison	48	−41	11.4	1.71	21.5
Halls Gulch	40	−21	18.1	2.15	32.5
Hamps	62	−27	20.6	0.58	7.0
Hoehne	67	−32	25.4	0.19	4.0
Holly	68	−20	21.9	0.35	7.0
Husted	63	−33	20.2	0.39	4.0
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Idaho Springs	55	−22	26.2	0.33	5.2
Lake Moraine	47	−20	19.7	1.56	20.0
Lamar	70	−20	24.4	0.35	6.0
Laporte				0.25	4.5
Las Animas	72	−28	24.8	0.23	3.0
Lay	46	−47	13.9	1.94	21.5
Leroy	63	−22	18.6	0.30	4.8
Longs Peak	52	−28	20.0	1.23	11.5
Mancos	57	−22	31.0	3.98	41.0
Marshall Pass				2.93	37.0
Meeker	49	−35	21.2	1.55	19.7
Montrose	53	−27	27.6	1.43	18.0
Pagoda	50	−34	21.5	1.27	14.0
Paonia				3.41	28.0
Platte Canyon				0.42	6.0
Rockyford	67	−24	24.6	0.11	3.0
Saguache	43	−21	19.7	0.42	7.0
Salida	58	−20	29.8	0.39	5.6
San Luis	48[e]	−26	19.2[e]	0.04	0.7
Santa Clara	54	−25	26.7	0.60	9.0
Sheridan Lake	66	−28	19.0	0.10	2.0
Silt	51	−22	26.4	2.10	24.0
Silverton	49	−25	21.8	4.04	46.5
Sugar City				0.11	2.4
Sugar Loaf	53	−28	22.3	1.10	16.0
Trinidad	83	−17	32.6	0.14	5.0
Victor	58	−25	24.2	0.72	7.5
Vilas				0.20	3.0
Wagon Wheel	48	−30	19.2	1.26	16.0
Walden	40	−38	10.0	0.56	9.5
Waterdale	63	−25	19.2	0.39	
Westcliffe	50	−36	20.6	0.86	10.5
Wray	69	−18	21.6	0.05	1.2
Yuma				0.13	2.0
Connecticut.					
Bridgeport	49	2	22.8	2.22	7.4
Canton	46	−20	16.5	1.12	8.0
Colchester	48	− 3	20.6	2.00	8.0
Falls Village				0.82	7.8
Hawleyville	41	− 5	19.0	1.71	11.5
Lake Konomoc				1.76	
New London	46	3	24.3	1.66	4.5
North Grosvenor Dale	45	−10	18.6	1.85	
Norwalk	46	−11	20.6	1.42	6.0
Southington	42	−14	19.2	1.80	8.5
South Manchester				1.34	6.0
Storrs	43	− 5	19.4	1.21	
Voluntown	48	− 8	22.0	2.05	6.5
Waterbury	48	− 7	19.8	1.50	8.0
West Cornwall	44	− 7	16.3	1.68	16.0
West Simsbury				1.39	10.0
Delaware.					
Delaware City				3.13	
Milford	51	− 1	27.6	3.88	
Millsboro	53	− 6	27.8	5.44	
Newark	42	− 1	23.4		
Seaford	50	− 2	26.8	3.83	
District of Columbia.					
Distributing Reservoir[e5]	46	3	27.3		
Receiving Reservoir[e5]	44	− 3	26.5	2.19	
West Washington	50	2	25.9	2.82	7.1
Florida.					
Apalachicola	77	22	54.1	3.37	
Archer	81	28	57.9	3.92	
Avon Park	87	36	64.8	0.61	
Bartow	86	33	63.7	0.64	
Bonifay	74	16	49.4	8.35	
Brooksville	85	29	60.4	1.92	
Clermont	87	34	62.6	2.40	
De Funiak Springs	75	12	47.8	10.32	
Deland	84	30	57.6		
Eustis	84	29	59.4	1.63	
Federal Point	81	31	55.6	3.81	
Fernandina	78	25	50.9	5.44	
Flamingo	85	45	71.4	0.09	
Fort Meade	84	30	63.2	0.46	
Fort Pierce	88	39	65.8	T.	
Gainesville	82	27	55.8	3.29	
Grasmere	82	33	59.6		
Huntington	85	31	57.5	3.45	
Hypoluxo	89	45	67.8	1.75	
Inverness	83	30	58.8	3.01	
Jasper	77	21	50.0	7.72	
Johnstown	79[e]	25[d]	52.8[e]	4.91	
Kissimmee	84	33	60.8	0.91	
Lake City	79	24	54.4	4.78	
Madison	78	20	54.0	7.17	
Malabar	88	36	63.0	0.82	
Manatee	83	34	63.4	0.90	
Marco	84	40	67.6		
Marianna	76	15	49.4	9.06	
Merritt Island	84	40	63.0	0.84	
Miami	85	46	71.6	0.64	
Molino	76	13	47.6	9.23	
Monticello	75	18	52.6	7.13	
Myers	85	39	66.0	0.10	
Nocatee	87	33	66.4	1.09	
Ocala	87	26	58.4	4.39	
Florida—Cont'd.	°	°	°	*Ins.*	*Ins.*
Orange City	87	32	60.0	1.94	
Orange Home	84	30	59.8	2.73	
Orlando	86	33	61.0	2.12	
Pinemount	86	21	53.2	4.69	
Plant City	89	29	62.8	1.23	
Rockwell	84[f]	29[f]	57.8[f]	2.69	
St. Andrews	71	18	50.0	6.66	
St. Augustine	82	29	53.8	5.02	
St. Leo	85	31	61.4	1.76	
Sand Key	82	55	70.8	0.18	
Stephensville	78	23	53.4	5.62	
Sumner	78	26	55.4	2.63	
Switzerland	81	28	54.0	4.47	
Tallahassee	72	18	53.0	6.95	
Tarpon Springs	83	30	59.8	2.11	
Titusville	87	32	60.0	2.53	
Wausau	70	22	47.2	7.77	
Switzerland	75	18	52.2	5.05	
Georgia.					
Abbeville				8.58	
Adairsville	64	− 2	34.0	6.98	3.0
Albany	74	18	47.0	8.21	
Allapaha	75	12	48.0	5.80	
Americus	66	10	42.6	8.94	
Athens	62	4	35.6	5.89	0.1
Bainbridge	75	17	49.0	5.91	
Blakely	74	12	46.2	7.65	
Bowersville	66		36.8	3.50	4.5
Butler				10.30	T.
Camak	69	8	40.2	6.04	T.
Carrollton	64	2	36.8	4.56	
Carlton				5.76	7.0
Clayton	64	4	36.4	6.80	8.0
Columbus	79[i]	10[i]	43.4[i]	7.58	
Covington	67[f]	3[f]	37.1[f]	6.09	1.0
Cordele	69	9	42.7	8.91	
Cuthbert	66	10	43.0	7.80	
Dahlonega	62	0	34.8	7.98	7.5
Dawson	71	12	46.2	8.61	
Diamond	58[d]	3[d]	34.0[d]	6.00	
Dublin				9.94	
Dudley	68	11	42.2	9.55	
Eastman	67	12	43.6	8.37	
Eatonton	65	7	40.8	5.46	
Elberton	66	6	38.1	5.52	5.0
Experiment	64	4	37.6	5.48	T.
Fleming	81	19	49.4	6.24	
Forsyth	67	6	40.0	6.76	
Fort Gaines	69	13	44.4	8.25	
Gainesville	59	3	34.4	7.31	3.0
Gillsville	64	3	37.4	6.70	
Glenville	75	18	46.1	5.47	
Greenbush	63	− 7	34.6	8.46	5.7
Greensboro	67	7	37.4	5.89	2.5
Griffin	64	4	35.9	4.36	
Harrison	74	10	41.4	9.48	
Hawkinsville	70	12	42.0	9.24	
Lost Mountain	65	0	35.6	6.91	1.0
Louisville	76	10	41.0	7.79	
Lumpkin	69	8	42.8	9.68	
Marshallville	67	10	41.9	11.00	
Mauzy	75	16	49.4	5.43	
Milledgeville	65	9	40.1	8.60	
Millen	69	15	43.6	6.35	
Montezuma				10.63	
Monticello	65	6	38.6	6.87	
Morgan	72	13	45.0	8.14	T.
Newnan	66	3	36.2	5.79	
Point Peter	66	6	36.1	6.22	5.0
Poulan	76	14	46.6	4.45	
Putnam	68	8	42.5	13.44	
Quitman	77	19	50.6	6.88	
Ramsey	62	− 6	36.5	7.84	7.5
Rome	67	− 3	35.8	6.18	6.0
St. Marys	79	23	50.6	4.13	
Statesboro	73	15	45.0	4.84	
Talbotton	70	7	41.1	7.71	T.
Tallapoosa	59	− 8	35.8		2.0
Thomasville	73	16	50.8	6.11	
Toccoa	65	4	35.0	7.45	
Valona	76	25	49.0	4.87	
Vidalia	75	14	46.9	5.50	
Washington	64	8	37.1	6.69	3.0
Waverly	81	20	50.3	7.02	
Waycross	77	20	50.8	6.31	
Waynesboro	67	2	40.8	8.16	1.7
Westpoint				7.04	T.
Idaho.					
Albion	54	−17	26.4	0.60	6.0
American Falls	58	−28	24.1	0.50	
Blackfoot	56	−32	23.8	1.09	
Blue Lakes	70	− 8	55.6	0.60	3.5
Burnside	44	−17	17.3	0.04	0.4
Caldwell	63	− 3	32.4	0.39	4.6
Cambridge	52	−20	25.7	0.35	
Chesterfield	47	−48	15.0	0.69	10.0
Dewey	58[d]	−24[d]	22.8[d]	0.29	2.9
Ditto Creek	63	− 6	31.9	0.15	1.4

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Forney	57	−31	22.7	0.75	7.5
Garnet	67	5	36.6	0.00	
Glens Ferry	.....	.....	.....	0.10	1.0
Grangeville	62	−20	29.8	1.00	5.0
Idaho City	51	−27	24.8	.....	
Idaho Falls	57	−32	23.2	0.56	5.0
Lake	46	−42	2.8	0.00	
Lakeview	55	− 9	27.4	1.95	6.0
Landore	.....	.....	.....	1.42	19.8
Lost River	54	−22	21.4	0.93	6.0
Milner	64	−17	29.8	0.20	2.0
Moscow	59	−13	31.4	0.65	3.3
Murray	56	−27	24.0	1.11	10.0
Oakley	60	−14	29.1	0.60	.....
Ola	52	−22	27.8	0.48	4.6
Paris	46	−32	16.2	0.51	6.5
Payette	62	− 2	34.2	0.49	
Pollock	64	− 3	35.9	0.45	2.0
Poplar	.....	.....	.....	0.37	1.2
Porthill	53	−21	21.6	1.13	7.0
Priest River	52	−27	24.0	2.05	5.2
Roosevelt	51	−30	21.6	0.72	10.0
St. Maries	67	−26	28.6	1.29	11.5
Soldier	44	−15	16.8	1.07	10.8
Swan Valley	48	−43	17.1	.....	.....
Victor [e]	45	−37	18.2	.....	.....
Weston	52	−21	24.6	0.60	4.5
Illinois.					
Aledo	55	−30	15.1	1.52	14.5
Alexander	59	−27	18.4	0.88	6.6
Antioch	44	−25	13.4	2.05	21.0
Ashton	46	−32	13.2	2.34	21.0
Astoria	54	−25	16.6	2.78	24.2
Aurora	49	−25	15.6	1.33	13.4
Benton	63	−14	26.6	1.15	4.5
Bloomington	54	−24	18.4	1.82	15.3
Bushnell	56	−27	17.2	1.60	12.0
Cambridge	51	−25	15.2	2.40	21.0
Carlinville	64	−23	21.4	1.17	12.0
Carrollton	64	−25	21.1	1.40	10.0
Charleston	55	−23	21.2	1.49	9.9
Chester	.....	.....	.....	2.19	14.8
Cisne	60	−17	24.7	1.27	7.5
Coatsburg	57	−29	17.0	0.95	10.0
Cobden	65	−13	27.0	2.10	5.5
Colchester	59	−28	17.6	1.88	11.3
Decatur	57	−25	19.9	1.72	13.6
Dixon	50	−27	12.3	1.24	.....
Effingham	58	−21	22.6	2.09	10.2
Equality	65	−10	28.0	1.70	5.5
Flora	55	−19	22.4	1.29	6.7
Friendgrove	54	−15	24.6	1.58	7.0
Galva	48	−28	13.1	1.64	22.1
Grafton	.....	.....	.....	0.67	8.0
Greenville	61	−21	21.8	1.73	11.3
Griggsville	58	−25	19.8	1.50	.....
Halfway	60[b]	−12[b]	27.2[b]	1.46	4.0
Havana	57	−26	18.3	2.20	13.2
Henry	50	−27	16.6	1.76	16.5
Hillsboro	61	−22	21.9	0.86	7.8
Hoopeston	46	−25	17.4	2.77	25.0
Joliet	45	−23	17.6	1.43	11.1
Kishwaukee	45	−26	13.2	1.42	14.0
Knoxville	51	−28	15.8	1.13	17.5
Lagrange	49	−22	16.4	1.06	9.5
Laharpe	47	−30	14.2	1.99	13.5
Lanark	49	−29	13.8	1.26	9.1
Loami	.....	.....	.....	1.01	7.2
McLeansboro	59	−13	25.5	1.55	10.0
Martinsville [e]	56	−22	19.0	.....	.....
Martinton	49	−23	16.4	2.05	19.2
Mascoutah	60	−18	22.8	1.84	14.4
Minonk	48	−28	16.2	1.06	12.0
Monmouth	55	−27	15.6	2.04	15.4
Morrison	46	−30	13.4	2.89	24.0
Morrisonville	58	−25	20.2	0.99	10.2
Mount Carmel	.....	.....	.....	2.28	12.8
Mount Pulaski	56	−25	18.4	1.37	10.5
Mount Vernon	64	−20	25.4	1.44	6.0
New Burnside	64	−13	26.5	1.72	.....
Olney	56	−17	24.2	1.29	8.9
Ottawa	50	−23	16.8	1.93	14.6
Palestine	57	−18	23.8	1.45	7.3
Pana	57	−24	20.6	1.17	9.0
Paris	56	−21	19.6	2.03	.....
Peoria *a*	52	−22	20.8	1.63	12.0
Philo	54	−24	18.2	1.68	12.2
Plumhill	68	−18	24.0	1.45	5.5
Pontiac	49	−23	17.5	1.89	14.0
Princeville	48	−27	15.8	1.44	11.5
Rantoul	50	−24	18.3	1.50	17.0
Raum	62	−12	26.0	2.03	3.9
Riley	46	−27	13.3	1.69	14.8
Robinson	57	−18	23.0	1.77	8.7
Rushville	60	−26	18.2	1.07	11.0
St. Charles	50	−24	14.9	2.78	21.0
St. John	63	−15	25.8	1.94	7.5
Shobonier	60	−19	22.3	1.65	10.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Streator	45	−26	14.8	1.38	.....
Sullivan	58	−24	20.3	1.37	12.5
Sycamore	40	−26	13.8	1.45	13.0
Tilden	64	−17	24.0	1.52	7.5
Tiskilwa	42	−28	14.5	1.35	11.8
Tuscola	56	−23	18.2	1.34	10.0
Urbana	49	−25	16.8	2.27	18.5
Walnut	47	−26	15.8	1.86	15.6
Warsaw	.....	.....	.....	1.38	12.5
Winchester	56	−25	18.2	1.57	15.8
Windsor	58	−23	20.4	1.57	9.6
Winnebago	46	−26	12.6	1.69	19.0
Yorkville	46	−26	14.5	2.12	7.7
Zion	46	−28	13.4	2.18	18.5
Indiana.					
Anderson	46	−17	19.6	2.41	16.8
Angola	39	−15	18.6	2.29	19.7
Auburn	40	−16	16.4	0.96	.....
Bedford	58	−13	26.4	2.03	4.0
Bloomington	52	−14	22.9	2.82	15.0
Bluffton	48	−18	15.8	2.30	.....
Butlerville	51	− 9	23.1	2.39	7.5
Cambridge City	46	−23	17.8	2.02	12.5
Columbus	54	−11	22.8	1.81	9.0
Connersville	46	−15	21.1	1.79	10.7
Crawfordsville	48	.....	20.4	1.20	9.2
Delphi	50	−24	16.1	1.94	18.5
Farmersburg	55	−20	23.1	.....	.....
Farmland	46	−13	20.2	1.39	15.0
Fort Wayne	45	−18	18.4	1.68	12.0
Franklin	49	−17	22.2	2.06	14.2
Greencastle	47	−17	20.4	2.41	19.9
Greenfield	47	−16	21.4	1.85	18.0
Greensburg	50	−12	22.4	2.15	13.2
Hammond	42	−23	17.0	2.38	16.0
Hector	48	−19	19.9	1.35	9.0
Holland	58	−13	26.2	2.51	2.8
Huntington	41	−17	15.9	1.52	14.0
Jeffersonville	53	− 2	27.4	2.21	1.5
Kokomo	48	−20	17.4	1.10	11.0
Lafayette	47	−22	16.4	3.65	18.0
Laporte	42	−17	18.1	1.76	23.8
Logansport	47	−19	16.8	1.51	.....
Madison *a*	55	− 4	26.6	2.22	4.2
Marengo	55	− 6	25.3	4.18	18.2
Marion	48	−20	18.6	2.06	13.1
Markle	46	−19	17.9	1.30	9.0
Mauzy	47	−15	19.4	2.28	15.0
Moores Hill	51	− 9	23.1	2.18	7.5
Mount Vernon	52	−13	22.8	0.70	5.2
Northfield	44	−22	17.4	1.90	16.5
Paoli	57	−13	24.5	2.00	4.0
Princeton	55	−14	24.6	3.50	11.0
Rensselaer	43	−23	17.5	2.10	18.0
Richmond	47	−16	20.1	1.48	5.7
Rochester	47	−21	17.6	3.56	14.5
Rockville	50	−22	20.2	1.65	14.0
Rome	58	− 5	25.7	3.70	5.4
Salem	57	−11	25.3	2.56	7.5
Scottsburg	54	− 7	27.5	1.89	3.5
Seymour	56	−11	26.2	3.56	9.5
Shelbyville	45	−17	20.8	1.87	12.0
South Bend	45	−18	14.9	1.61	16.0
Syracuse	46	−16	16.6	2.00	25.5
Terre Haute	53	−17	24.5	1.80	13.0
Topeka	36	−12	15.8	1.85	18.5
Valparaiso	47	−21	18.1	1.45	.....
Veedersburg	.....	.....	.....	1.61	15.5
Vevay	49	− 5	26.1	1.35	8.0
Vincennes	59	−15	23.1	1.84	5.8
Washington	55	−14	22.8	1.93	4.5
Worthington	52	−17	24.8	2.10	11.0
Indian Territory.					
Ardmore	68	− 3	30.6	1.99	14.0
Calvin	.....	.....	.....	1.40	11.0
Chickasha	70	−10	28.5	1.42	10.2
Durant	72	− 3	32.3	2.03	7.0
Fairland	67	−23	25.2	1.45	14.5
Fort Gibson	.....	.....	.....	1.75	16.5
Goodwater	72	0	35.6	3.27	4.6
Healdton	72	− 6	30.4	1.80	18.0
Holdenville	67	− 9	30.0	1.02	8.4
Marlow	71	− 9	27.4	2.05	11.3
Muskogee	66	−14	28.3	1.38	9.0
Okmulgee	67	−20	28.0	2.11	6.7
Pauls Valley	68	−12	27.2	1.25	12.5
Ravia	70	− 3	33.2	1.64	12.1
South McAlister	71	− 7	32.8	1.70	9.9
Tahlequah	.....	.....	.....	0.92	9.2
Tulsa	68	−15	27.6	2.55	11.0
Vinita	68	−27	26.2	2.40	17.5
Webbers Falls	69	− 3	29.4	0.65	6.0
Iowa.					
Afton	62	−25	16.1	1.35	13.5
Albia	64	−29	12.5	1.87	23.0
Algona	50	−31	11.0	1.60	22.0
Allerton	64	−33	15.7	1.82	14.6
Alta	59	−33	11.2	1.26	14.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Amana	48	−32	12.8	1.93	15.7
Ames	61	−31	13.5	0.67	11.0
Atlantic	66	−36	12.8	2.10	21.0
Audubon	62	−35	12.3	1.79	17.9
Baxter	58	−32	11.7	1.40	14.0
Bedford	68	−32	15.4	1.56	17.2
Belleplaine	47	−32	10.8	2.97	22.8
Bonaparte	62	−31	15.2	1.42	12.0
Boone	60	−27	14.7	1.37	16.8
Britt	47	−34	10.8	1.84	17.2
Buckingham	.....	.....	.....	1.23	11.5
Burlington	61	−27	17.2	2.40	.....
Carroll	66	−33	12.7	1.75	17.2
Chariton	64	−28	14.8	2.03	15.0
Clarinda	68	−29	12.4	1.18	15.2
Clearlake	.....	−31	8.6[e]	1.40	14.0
Clinton	49	−27	13.6	2.44	18.0
Columbus Junction	55	−28	16.0	1.82	19.0
Corning	63	−32	13.3	2.00	20.0
Corydon	66	−31	15.8	1.71	19.5
Cresco	42	−27	10.6	1.03	9.9
Cumberland	.....	.....	.....	2.25	27.0
Decorah	47	−26	11.2	1.18	13.0
Delaware	45	−31	11.0	1.34	12.0
Denison	64	−37	13.2	1.52	12.8
Desoto	64	−32	14.0	1.85	18.0
Dows	49	−32	9.8	2.90	27.0
Earlham	63	−29	14.0	1.38	18.0
Elkader	51	−30	11.8	1.12	12.0
Estherville	55	−28	9.0	1.18	17.0
Fayette	46	−30	9.2	1.43	14.2
Florence	.....	.....	.....	2.24	17.5
Forest City	46	−31	8.1	1.95	18.5
Fort Dodge	58	−28	10.5	1.50	13.0
Fort Madison	.....	.....	.....	2.13	14.0
Galva	59	−41	12.5	1.30	13.0
Gilman	.....	.....	.....	1.75	15.0
Glenwood	69	−29	16.1	1.60	14.0
Grand Meadow	46	−29	11.0	1.33	10.0
Greene	46	−29	11.3	0.94	16.0
Greenfield	63	−33	14.2	1.43	17.4
Grinnell	53	−26	13.5	2.03	17.5
Grundy Center	48	−34	10.8	2.55	27.0
Guthrie Center	62	−32	13.8	1.15	.....
Hampton	50	−30	11.4	1.48	21.5
Hanlontown	47	−31	9.6	1.75	17.5
Harlan	63	−37	12.4	1.16	14.5
Hopeville	64	−30	14.8	0.68	.....
Humboldt	54	−32	12.8	0.75	7.5
Ida Grove	60	−41	12.9	1.10	11.0
Independence	48	−29	10.3	2.00	20.0
Indianola	64	−28	15.2	1.68	16.8
Inwood	62	−34	10.8	0.70	7.0
Iowa City	55	−32	10.4	1.90	21.0
Iowa Falls	48	−32	10.0	1.54	19.5
Keosauqua	62	−28	13.4	2.02	12.3
Lacona	.....	.....	.....	2.63	.....
Larrabee	59	−36	11.4	1.40	13.8
Leclaire	.....	.....	.....	1.56	15.5
Lemars	61	−35	11.8	0.60	7.2
Lenox	63	−37	13.6	1.41	12.8
Leon	62	−28	16.0	1.85	18.5
Little Sioux	66	−38	14.2	0.89	9.2
Logan	63	−34	15.2	1.40	14.0
Maple Valley	.....	.....	.....	1.00	10.0
Maquoketa	48	−31	10.2	1.61	21.0
Marshalltown	57	−30	10.1	1.49	15.2
Mason City	45	−27	11.6	1.61	15.5
Massena	65	−31	14.4	1.03	18.0
Mountayr	68	−28	16.2	1.65	15.0
Mount Pleasant	58	−27	15.2	1.68	15.5
Mount Vernon	52	−30	13.0	2.37	25.2
Muscatine	.....	.....	.....	1.37	13.4
New Hampton	41	−32	10.5	0.97	.....
Newton	55	−34	12.8	2.00	22.0
Northwood	43	−28	8.4	1.47	14.8
Odebolt	60	−34	13.2	0.88	12.0
Ogden	62	−32	13.6	1.67	16.5
Olin	43	−28	12.4	2.20	21.5
Onawa	69	−30	15.9	1.10	10.5
Osage	43	−28	11.2	1.18	11.2
Oskaloosa	60	−31	13.8	1.26	14.8
Ottumwa	60	−24	16.2	2.83	16.5
Pacific Junction	67	−37	14.5	0.98	9.8
Perry	61	−33	13.8	1.85	18.5
Plover	55	−35	10.4	1.35	13.5
Pocahontas	53	−30	12.2	1.55	15.5
Redoak	60	−26	15.4	1.47	18.8
Ridgeway	47	−28	13.6	2.00	12.5
Rock Rapids	64	−33	10.6	0.60	6.0
Rockwell City	58	−32	12.8	1.30	13.0
Sac City	57	−28	13.0	1.57	15.8
St. Charles	67	−27	16.4	1.57	18.8
Sheldon	63	−35	11.0	1.30	9.0
Sibley	58	−36	8.3	0.60	6.0
Sigourney	54	−30	15.2	2.11	19.0
Sioux Center	60	−32	11.8	0.60	6.0
Stockport	62	−26	16.8	1.63	13.0

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Storm Lake	59	—34	8.2	1.31	13.1
Thurman	66	—37	14.4	1.14	14.1
Tipton	49	—24	15.2	2.60	23.7
Toledo	53	—28	12.2	1.51	25.0
Vinton	46	—30	11.3	2.10	21.0
Wapello	.....	—22	13.3[e]	2.06	15.0
Washington	57	—29	14.7	2.14	.....
Washta	.....	.....	.....	1.00	10.0
Waterloo	45	—27	12.0	1.46	13.0
Waukee	66	—32	15.7	2.38	23.5
Waverly	44	—28	10.6	1.53	17.1
Westbend	52	—32	12.0	2.00	20.0
Whatcheer	69	—31	16.4	0.75	7.0
Whitten	48	—33	10.7	2.10	21.0
Wilton Junction	49	—33	13.7	2.67	21.0
Winterset	59	—2.)	14.9	0.85	11.0
Woodburn	61	—30	14.8	1.87	18.0
Zearing	55	—35	11.8	2.18	18.5
Kansas.					
Abilene	.....	.....	.....	0.93	9.3
Achilles	68	—26	18.4	0.39	3.9
Alton	71	—29	20.7	0.40	4.0
Atchison	67	—22	20.0	1.65	11.0
Baker	67	—28	17.8	1.86	11.0
Beloit	.....	.....	.....	1.12	11.5
Blue Rapids	.....	.....	.....	1.43	17.1
Burlington	70	—27	21.2	0.97	12.6
Chapman	68	—29	20.0	0.73	7.3
Clay Center	70	—35	16.4	0.84	7.2
Columbus	63	—28	22.6	2.31	20.0
Cottonwood Falls	69	—30	20.4	0.95	9.5
Cunningham	76	—21	24.6	0.45	4.5
Dresden	66	—20	21.0	0.45	4.5
Eldorado	68	—28	22.3	0.73	6.9
Ellinwood	71	—21	23.4	0.80	8.5
Ellsworth	74	—28	20.6	1.40	8.7
Emporia	70	—23	20.9	1.67	17.0
Englewood	69	—12	26.2	0.29	2.1
Enterprise	71[e]	—29	21.4[e]	0.53	7.6
Eureka	.....	.....	.....	1.16	11.5
Fall River	68	—31	22.1	0.59	5.9
Farnsworth	71	—21	21.6	0.36	5.1
Forsha	69	—28	23.4	0.60	6.0
Fort Leavenworth	67	—21	21.4	2.12	15.0
Fort Scott	69	—24	23.2	1.77	16.3
Frankfort	70	—35	18.1	1.41	14.2
Garden City	86	—19	22.3	0.71	8.5
Gove	68	—15	.....	0.60	6.0
Grenola	66	—23	21.2	0.90	9.0
Harrison	68	—30	16.6	0.95	9.1
Horton	67	—25	18.6	1.30	11.5
Hoxie	66	—21	20.4	0.50	5.0
Hugoton	64	—18	21.0	0.20	2.0
Hutchinson	68	—27	21.4	0.60	7.5
Independence	68	—23	24.0	1.74	14.5
Iola	.....	.....	.....	1.04	10.8
Jetmore	60	—21	20.0[e]	0.10	1.0
Larned	68	—24	21.2	0.51	5.2
Lawrence	68	—20	21.7	1.95	15.5
Lebanon	65	—40	13.5	1.10	11.0
Lebo	68	—25	20.2	0.81	8.0
Lindsborg	.....	.....	.....	0.50	5.1
Macksville	65	—22	22.4	0.33	5.9
McPherson	66	—22	21.2	1.26	10.0
Madison	70	—28	21.0	0.99	16.5
Manhattan[b]	70	—26	20.5	1.73	15.1
Manhattan[c]	67	—25	19.0	1.02	10.7
Marion	66	—28	21.6	0.75	7.5
Medicine Lodge	71	—22	27.0	0.27	2.7
Minneapolis	72	—28	20.0	1.05	10.5
Moran	68	—30	20.9	1.36	12.7
Mounthope	.....	.....	.....	0.47	5.5
Ness City	.....	.....	.....	0.89	7.5
Newton	69	—28	21.2	0.70	6.4
Norton	70	—25	19.0	1.23	11.6
Norwich	68	—21	24.6	1.43	7.0
Oberlin	.....	.....	.....	0.60	6.0
Osage City	.....	.....	.....	1.04	12.2
Osborne	.....	.....	.....	0.83	9.0
Oswego	67	—30	22.3	1.44	13.0
Ottawa	71	—28	20.8	1.24	17.6
Plainville	65	—15	21.5	0.47	4.7
Pleasanton	67	—23	22.2	1.61	14.3
Pratt	66	—20	23.9	0.96	7.0
Republic	69	—31	17.0	0.96	8.0
Rome	68	—31	22.4	0.92	10.0
Russell	72	—24	21.1	0.44	5.8
Salina	70	—31	20.1	0.38	5.0
Sedan	68	—21	23.4	1.15	11.5
Toronto	69	—28	19.3	2.42	8.0
Ulysses	63	—20	20.3	0.70	7.0
Valley Falls	72	—29	19.9	1.02	12.0
Viroqua	67	—18	23.4	0.50	5.0
Wakeeney (near)	.....	.....	.....	0.35	3.5
Wallace	68	—24	21.3	0.58	5.8
Walnut	68	—27	21.6	1.51	13.5
Wamego[e1]	67	—25	19.4	1.40	13.0
Winfield	65	—27	22.8	1.14	8.4

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kentucky.	°	°	°	*Ins.*	*Ins.*
Alpha	62	— 8	32.4	4.40	8.0
Anchorage	55	— 5	25.6	1.93	3.0
Bardstown	60	— 6	28.2	2.72	2.5
Beattyville	59	—14	26.1	2.77	5.0
Beaver Dam	62	— 4	25.4	2.36	1.0
Berea	66	— 9	29.6	2.54	2.4
Blandville	61	— 6	26.8	2.02	5.2
Bowling Green	67	0	30.0	1.96	3.2
Burnside	60	—10	31.8	3.25	.....
Cadiz	65	— 5	28.6	2.12	.....
Calhoun	62	0	28.8	2.05	1.5
Catlettsburg	60	— 4	29.2	2.18	2.0
Earlington	62	— 5	26.2	2.30	5.0
Edmonton	61	—16	29.3	2.53	6.0
Eubank	59	—10	25.7	1.57	5.6
Falmouth	.....	.....	.....	2.22	4.0
Farmers	52	—15	26.7	1.89	2.5
Frankfort	52	— 4	28.0	2.25	0.5
Franklin	69	0	30.0	.....	.....
Greensburg	62	—13	26.2	2.05	3.8
Hopkinsville	64	— 5	28.6	2.77	6.0
Irvington	58	— 5	28.0	2.23	T.
Jackson	60	— 8	31.2	2.99	8.5
Leitchfield	59	— 5	26.2	2.23	2.7
Loretto	58	— 7	29.8	2.59	.....
Manchester	59	—11	30.1	3.65	7.0
Marion	60	— 8	27.6	1.92	.....
Mayfield	63	— 5	28.8	2.47	2.5
Maysville	44[e]	— 7	22.4[e]	2.44	3.6
Middlesboro	57[e]	—10[e]	31.7[e]	3.85	.....
Mount Sterling	47	— 6	26.8	2.98	8.0
Owensboro	56	— 6	29.2	2.00	1.0
Owenton	48	— 6	24.4	2.21	7.0
Paducah	65	— 5	30.0	2.03	3.1
Princeton	64	— 4	29.8	2.41	6.0
Richmond	56	— 8	28.0	2.64	.....
St. John	59	— 5	25.0	2.31	1.3
Scott	49	— 6	24.6	1.77	5.1
Shelby City	55	—13	27.0	2.70	3.5
Taylorsville	55	— 5	27.0	2.33	1.2
Williamsburg	60	— 2	30.1	2.68	.....
Williamstown	48	— 8	25.8	1.95	2.5
Louisiana.					
Abbeville	74	16	45.4	9.50	T.
Alexandria	75	12	41.6	8.96	T.
Amite	73	14	45.2	12.30	T.
Baton Rouge	78	15	44.3	12.38	T.
Burnside	76	17	47.0	10.40	.....
Calhoun	73	4	38.0	6.88	1.0
Cameron	69	18	45.4	7.05	.....
Caspiana	74	5	40.0	5.72	5.0
Cheneyville	74	14	41.4	9.32	.....
Clinton	73	13	44.3	13.44	.....
Collinston	78	9	38.8	8.71	4.5
Covington	65	15	44.8	9.44	.....
Donaldsonville	79	16	46.6	8.88	T.
Emilie	72	17	47.3	8.12	T.
Farmerville	75	7[h]	38.3[d]	5.00	2.0
Franklin	75	19	46.3	9.29	.....
Georgetown	73	10	40.6	7.59	2.4
Grand Coteau	74	14	45.0	10.17	T.
Hammond	72	15	45.9	9.83	.....
Houma	73	17	47.8	5.18	.....
Jennings	74	17	44.2	9.64	T.
Lafayette	74	14[e]	44.0[e]	10.26	T.
Lake Charles	76	15	44.3	7.17	.....
Lakeside	.....	.....	.....	7.65	.....
Lawrence	75	19	50.5	3.69	.....
Leesville	74	9	41.2	7.05	T.
Libertyhill	75	1	39.1	6.60	5.0
Logansport	.....	.....	.....	5.40	.....
Mansfield	73	4	36.2	2.70	4.0
Melville	77	15	43.6	10.11	T.
Minden	71	— 1	36.9	5.81	.....
Monroe	81	10	39.6	5.59	0.4
Morgan City	.....	.....	.....	5.40	.....
New Iberia	72	17	46.4	6.60	T.
Opelousas	75	15	43.3	12.69	.....
Oxford[d]	74	8	38.6	.....	.....
Plain Dealing	72	0	37.0	4.53	1.2
Port Eads	68	28	50.6	3.61	.....
Rayne	75	17	45.4	8.64	.....
Reserve	71	19	48.0	6.78	.....
Robeline	73	11	38.4	5.84	.....
Ruston	75	0	38.4	5.50	3.5
St. Francisville	75	13	43.4	12.65	.....
Schriever	.....	.....	.....	6.68	.....
Southern University	.....	.....	.....	5.13	.....
Sugar Experiment Station	76	18	50.6	5.24	.....
Sugartown	71	12	42.6	8.36	.....
Simmsport	.....	.....	.....	5.58	.....
Venice	77	24	51.3	4.20	.....
Maine.					
Bar Harbor	42	— 1	18.6	3.20	28.0
Chesuncook	.....	.....	.....	0.69	5.0
Cornish	41	—17	16.2	1.51	14.2
Danforth	.....	.....	.....	2.43	24.0
Fairfield	43	—20	14.0	0.99	12.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Maine—Cont'd.	°	°	°	*Ins.*	*Ins.*
Farmington	40	—19	13.7	0.70	12.0
Gardiner	43	—17	14.2	1.32	11.5
Houlton	34	—19	12.1	1.60	16.0
Lewiston	42	—14	15.4	1.80	14.9
Madison	42	—18	14.4	1.61	11.5
Millinocket	37	—23	11.8	1.25	17.0
North Bridgton	41	—11	16.7	1.66	15.5
Oquossoc	36	—25	9.2	1.63	16.5
Orono	45	—19	14.8	2.29	22.0
Patten	32	—20	10.6	0.90	9.0
Rumford Falls	43	—15	13.8	1.11	10.2
South Lagrange	41	—26	12.8	1.22	11.2
The Forks	.....	.....	.....	1.11	12.0
Vanburen	43	—32	7.9	1.61	23.5
Winslow	42	—18	14.7	0.93	10.0
Maryland.					
Annapolis	48	2	26.0	1.98	.....
Bachmans Valley	44	— 5	21.0	2.01	12.0
Boettcherville	52	— 8	26.2	1.09	8.0
Cambridge	53	2	28.5	2.96	.....
Cheltenham	49	0	25.2	2.53	.....
Chestertown	46	0	24.0	3.26	.....
Chewsville	49	— 9	22.0	1.41	8.0
Clearspring	46	— 3	22.4	1.46	14.0
Coleman	46	1	25.2	2.46	6.0
Collegepark	51	— 8	25.4	.....	6.0
Colora	.....	.....	.....	3.31	11.6
Cumberland	.....	.....	.....	0.85	3.0
Darlington	46	— 2	23.2	2.50	8.5
Deerpark,[e]	47	—18	21.2	.....	.....
Denton	53	— 4	25.0	3.44	.....
Easton	49	— 3	26.2	3.24	.....
Fallston	47	— 1	24.2	2.43	6.0
Frederick	49	— 4	25.7	2.09	12.0
Grantsville	45	—15	19.8	1.80	11.5
Greatfalls	51	— 5	26.2	2.45	8.2
Greenspring Furnace	47	— 5	24.0	1.75	11.2
Hancock	51	— 2	24.6	1.72	.....
Harney	.....	.....	.....	2.39	9.5
Jewell	44	0	25.8	3.06	2.5
Johns Hopkins Hospital	49	4	28.2	.....	.....
Keedysville	50	— 6	24.3	2.22	9.0
Laurel	51	1	26.6	2.55	9.8
Mount St. Marys College	46	0	24.4	1.23	12.2
New Market	46	— 2	24.4	2.41	10.7
Oakland	50	—20	21.0	3.72	35.2
Pocomoke City	53	4	30.8	4.29	.....
Porto Bello	46	4	28.2	3.49	10.0
Prince Fredericktown	50	0	26.3	3.28	5.2
Princess Anne	52	0	28.6	4.23	.....
Solomons	46	6	27.8	3.72	.....
Sudlersville	50	— 3	25.6	3.66	.....
Takoma Park	49	— 1	24.4	3.01	.....
Van Bibber	45	1	25.6	2.55	.....
Westernport	52	— 3	24.8	0.43	3.8
Woodstock	48	0	26.6	2.16	9.0
Massachusetts.					
Amherst	49	—11	17.7	1.70	11.0
Bedford	43	— 6	20.4	1.08	8.0
Bluehill (summit)	41	— 2	19.9	1.89	11.0
Cambridge	46	0	21.3	1.90	.....
Chestnuthill	45	— 2	21.1	2.27	8.2
Concord	43	—14	18.0	1.85	12.2
East Templeton[e1]	40	— 6	17.6	1.46	11.5
Fall River	43	2	23.0	2.26	7.0
Fitchburg[b]	43	— 7	19.3	1.44	12.0
Framingham	54	— 8	20.7	2.12	9.7
Groton	42	—10	16.8	1.48	13.0
Hyannis	.....	.....	.....	2.01	6.5
Jefferson	.....	.....	.....	1.73	12.2
Lawrence	44	—13	18.4	1.46	9.5
Leominster	.....	.....	.....	1.31	11.1
Lowell[a]	46	—10	20.2	1.70	.....
Ludlow Center	42	—16	13.8	1.06	12.0
Middleboro	43	—10	21.8	1.72	6.0
Monson	44	—13	17.2	1.59	11.2
New Bedford	40	0	21.5	2.10	10.5
Pittsfield	.....	.....	.....	0.95	18.0
Plymouth	40	1	23.6	2.15	.....
Princeton	.....	.....	.....	1.73	14.0
Provincetown	42	7	25.4	1.19	3.8
Salem	.....	.....	.....	1.62	10.5
Somerset[e1]	46	—10	21.0	1.49	7.5
Sterling	.....	.....	.....	1.65	13.0
Taunton	43	—19	20.4	1.82	7.5
Webster	.....	.....	.....	1.61	9.5
Westboro	45	— 9	19.8	1.70	8.5
Weston	42	— 6	19.4	2.16	10.2
Williamstown	38	— 8	15.5	0.56	8.7
Winchendon	.....	.....	.....	1.46	13.5
Worcester	41	— 1	19.9	1.27	11.4
Michigan.					
Adrian	40	—17	17.7	1.10	10.0
Agricultural College	38	—16	15.8	1.25	12.5
Allegan[d]	40	—14	15.8	.....	.....
Alma	40	—17	14.8	1.32	14.0
Ann Arbor	36	—16	16.4	1.21	11.7
Arbela	38	—15	15.0	1.76	14.0

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Baldwin	38	—36	13.4	.....	.....
Ball Mountain	38	—17	15.4	1.64	15.8
Battlecreek	34	—15	15.0	1.30	11.0
Bay City	41	—15	13.9	1.20	12.0
Benzonia	37	— 8	14.8[d]	2.05	20.5
Berlin	36	—18	14.8	1.24	12.4
Berrien Springs	44	—19	16.2	2.82	25.0
Big Rapids	40	—24	11.8	1.60	16.0
Birmingham	37	—21	16.5	1.05	10.5
Bloomingdale	42	—17	16.4	0.65	6.5
Calumet	38	—14	12.6	1.12	14.0
Cassopolis	40	—16	15.8	1.20	12.0
Charlevoix	40	—13	12.6	3.05	30.5
Charlotte	43	—22	15.0	1.04	10.4
Chatham	47	—21	10.8	1.77	17.7
Cheboygan	39	—18	11.6	0.80	8.0
Clinton	36	—18	16.6	1.29	11.3
Coldwater	40	—17	17.0	1.50	10.0
Deer Park	37	—18	11.4	2.66	25.1
Detour	37	—20	11.3	1.60	16.0
Dundee	37	—17	16.6	2.02	14.5
Eagle Harbor	40	—15	12.6	1.00	.....
East Tawas	40	—16	13.0	1.65	16.5
Eloise	37	—19	15.4	1.50	17.8
Ewen	44	—40	7.5	.....	.....
Fennville	40	—15	17.4	1.55	15.5
Fitchburg	35	—16	14.8	1.85	19.0
Flint	37	—18	14.8	1.12	11.0
Frankfort	39[c]	— 5[j]	17.6[g]	.....	.....
Gaylord	36	—16	11.8[e]	1.50	15.0
Gladwin	42	—20	12.8	1.20	12.0
Grand Haven	37	— 9	18.0	0.78	.....
Grand Marais	40	.....	.....	1.40	14.0
Grape	36	—17	16.6	1.20	12.7
Grayling	35	—23	10.6	1.30	13.0
Hagar	40	—18	17.0	1.64	14.7
Harbor Beach	36	—14	15.8	0.40	4.0
Harrison	38	—15	12.6	2.00	20.0
Harrisville	39	—15	12.6	2.12	21.2
Hart	.....	.....	.....	2.00	20.0
Hastings	39	—22	15.3	1.50	8.5
Hayes	38	—18	13.7	1.50	15.0
Hillsdale	36	—15	16.0	1.57	13.0
Howell	35	—18	13.8	1.18	12.0
Humboldt	41	—37	6.4	0.20	2.0
Iron Mountain	49	—23	11.4	1.00	10.0
Iron River	53	—28	6.6	1.40	13.0
Ironwood	42	—25	9.6	0.50	5.0
Ishpeming	43	—24	9.4	.....	.....
Ivan	36	—20	10.3	1.14	17.0
Jackson	39	—14	17.5	1.56	15.0
Jeddo	35	—16	15.4	1.37	13.7
Kalamazoo	38	—18	14.8	2.20	22.0
Lake City	36	—19	9.6	1.50	15.0
Lansing	38	—14	16.8	1.03	13.4
Lapeer	38	—14	16.2	1.15	11.5
Ludington	41	— 2	16.7	2.60	26.0
Mackinaw City	40	—21	11.3	2.35	23.5
Mancelona	.....	.....	.....	2.20	22.0
Marine City	.....	.....	.....	2.20	13.0
Menominee	44	—18	14.2	0.80	8.0
Midland	40	—21	12.9	0.60	6.0
Montague	36	— 3	15.2	0.80	8.0
Muskegon	40	—23	17.3	1.25	12.5
Newberry	42	—20	8.9	1.10	11.0
Old Mission	38	—12	13.6	1.24	12.4
Olivet	38	—16	16.0	1.00	9.9
Omer	.....	.....	.....	1.00	10.0
Onaway	36	—19	12.0	.....	.....
Ovid	38	—16	15.2	1.20	12.0
Petoskey	40	—13	13.0	1.60	16.0
Plymouth	40	—16	16.6	0.70	7.0
Port Austin	35	—15	14.2	1.20	12.0
Powers	50	—20	11.0	1.20	12.0
Reed City	36	—24	11.6	.....	.....
Roscommon	36	—38	8.2	1.80	18.0
Saginaw (W. S.)	42	—14	15.8	1.05	12.1
St. Ignace	37	—19	13.5	.....	.....
St. Johns	40	—14	17.2	2.59	26.0
St. Joseph	.....	.....	.....	2.10	21.0
Slocum	39	—24	14.4	0.90	8.0
Somerset	36	—17	15.3	0.60	6.0
South Haven	40	—16	16.8	1.19	12.0
Stanton	40	—23	13.2	1.60	16.0
Thomaston	45	—34	8.0	.....	.....
Thornville	37	—11	17.0	1.66	19.0
Traverse City	38	—14	14.3	2.05	20.5
Vassar	40	—17	14.8	1.07	10.5
Wasepi	41	—16	15.2	1.41	9.6
Waverly	38	—27	15.6	1.70	17.0
Webberville	38	—16	15.4	2.40	24.0
West Branch	33	—16	11.8[g]	3.50	35.0
Wetmore	44	—29	11.2	1.10	11.0
Whitefish Point	37	—22	8.0	1.42	14.8
Ypsilanti	39	—20	15.4	1.74	15.7
Minnesota.					
Albert Lea	49	—29	10.2	0.91	9.0
Alexandria	49	—33	6.2	0.21	2.5
Angus	53	—39	5.9	0.40	4.0
Ashby	55	—30	10.2	0.18	2.7
Beaulieu	52	—37	7.6	0.06	0.7
Bemidji	50	—35	7.8	0.25	2.5
Bird Island	65	—31	11.2	0.20	2.0
Brainerd	52	—34	8.7	.....	.....
Caledonia	44	—30	9.8	0.98	9.5
Collegeville	56	—26	12.0	0.48	3.4
Crookston	53	—33	5.4	0.40	4.0
Detroit	52	—42	2.9	0.46	4.5
Faribault	57	—32	10.2	0.45	5.0
Farmington	54	—31	9.0	0.75	7.5
Fergus Falls	54	—38	8.8	0.24	2.4
Floodwood	50	—36	8.0	.....	.....
Glencoe	.....	.....	.....	0.40	4.0
Grand Meadow	47	—30	9.4	1.91	14.5
Hallock	48	—44	2.9	0.15	1.5
Hovland	.....	.....	.....	0.49	9.8
Lake Winnibigoshish	49	—35	4.7	0.28	2.5
Leech	50	—38	5.2	0.28	3.2
Long Prairie	52	—35	8.8	0.19	2.0
Luverne	50	—32	9.5	0.85	8.5
Lynd	54	—28	12.2	0.49	5.0
Mankato	.....	.....	.....	0.41	8.5
Mapleplain	55	—28	10.5	0.76	8.1
Milaca	54	—32	9.4	0.40	4.0
Milan	62	—33	10.8	0.72	7.2
Montevideo	61	—32	11.2	.....	.....
Mora	52	—32	9.8	0.25	3.5
Morris	52	—33	9.3	0.26	2.6
Mount Iron	45	—33	6.9	0.15	1.5
New London	58	—32	9.2	0.32	2.7
New Richland	53	—29	12.0	1.15	11.5
New Ulm	60	—28	9.8	0.65	6.5
Park Rapids	50	—33	3.7	0.42	4.2
Peterson	.....	.....	.....	0.77	9.9
Pine River	50	—39	5.2	0.15	3.0
Pipestone	49	—35	11.3	0.75	7.5
Pleasant Mounds	53	—28	11.6	0.75	14.0
Redwing	48	—31	10.9	1.03	10.0
Reeds	.....	.....	.....	0.94	11.8
Rolling Green	49	—28	9.6	2.40	23.0
St. Charles	45	—27	11.0	0.91	9.1
St. Cloud	55	—29	10.8	0.36	3.5
St. Peter	62	—32	11.7	0.28	2.8
Sandy Lake Dam	47	—35	6.6	0.29	3.5
Shakopee	56	—31	10.2	1.02	10.0
Wabasha	50	—30	12.2	0.92	10.0
Wadena	51	—36	7.4	0.12	1.2
Winnebago	54	—29	10.2	1.10	10.2
Winona	45	—28	8.5	1.05	8.5
Worthington	54	—32	11.2	1.18	11.8
Mississippi.					
Aberdeen	64	— 2	35.0	8.10	1.5
Agricultural College	67	2	37.3	6.75	5.0
Austin	71	— 6	33.2	3.80	8.0
Batesville	68	— 8	33.2	3.60	7.0
Bay St. Louis	73	15	47.4	8.79	.....
Biloxi	73	16	46.4	7.05	T.
Booneville	63	— 8	33.4	4.51	10.0
Canton	70	5	38.7	7.13	0.5
Columbia	.....	.....	.....	12.74	T.
Columbus	68	0	36.2	8.68	.....
Corinth	61	1	31.2	4.62	10.5
Crystal Springs	79	9	40.8	8.54	.....
Duck Hill	77	— 8	36.0	6.91	11.1
Edwards	68	7	37.8	8.51	1.0
Enterprise	.....	.....	.....	6.65	0.5
Fayette	73	10	40.9	8.27	T.
Fayette (near)	.....	.....	.....	10.30	2.0
Greenville[a]	69	4	35.8	4.40	2.8
Greenwood	72	3	35.5	6.11	3.0
Hattiesburg	.....	.....	.....	10.00	T.
Hazlehurst	71	10	40.7	11.15	0.1
Hernando	69	0	32.8	4.30	9.0
Holly Springs	66	0	31.8	2.58	8.5
Jackson	71	10	38.4	9.57	3.1
Kosciusko	70	2	37.4	7.97	5.5
Lake	76	4	38.4	9.10	0.5
Lake Como	72	12	43.0	10.25	T.
Laurel	74	10	42.8	9.62	T.
Leakesville	74	11	45.4	8.25	.....
Louisville	69	— 2	38.2	7.28	4.0
McNeill	.....	.....	.....	8.43	T.
Magee	71	10	37.5	8.92	1.5
Magnolia	75	11	44.8	12.82	T.
Merrill	.....	.....	.....	11.40	.....
Nitta Yuma	71	6	38.2	6.82	4.0
Okolona	69	8	35.0	7.25	3.0
Patmos	.....	.....	.....	7.46	1.4
Pearlington	74	15	47.8	5.76	.....
Pecan	74	15	47.9	10.52	.....
Pittsboro	69	0	35.6	6.33	3.7
Pontotoc	66	— 3	34.6	5.13	10.0
Poplarville	.....	.....	.....	11.49	.....
Port Gibson	75	11	40.4	8.96	T.
Ripley	72	0	33.2	2.70	8.0
Shelby	74	6	36.4	.....	.....
Shoccoe	73	.....	.....	7.94	3.0
Shubuta	.....	.....	.....	7.53	.....
Stonington	.....	.....	.....	7.96	.....
Suffolk	72	8	42.2	10.16	T.
Tchula	71	4	37.0	.....	.....
Tupelo	69	— 7	34.4	6.90	5.0
University	70	—10	35.1	4.86	6.5
Utica	75	10	38.8	7.41	.....
Walnutgrove	71[d]	4[d]	39.1[d]	7.39	0.4
Watervalley	68	— 9	35.2	5.80	11.0
Waynesboro	72	10	43.0	9.45	T.
Woodville	75	11	44.4	10.52	T.
Yazoo City	72	4	37.2	7.74	2.0
Missouri.					
Albany	.....	.....	.....	1.65	16.5
Appleton City	65	—29	20.8	1.49	16.0
Arlington	.....	.....	.....	1.90	16.0
Arthur	67	—35	21.2	1.40	14.0
Avalon	65	—27	18.6	2.30	15.5
Bethany	64	—27	16.4	1.76	15.6
Birchtree	65	—17	27.0	1.27	10.0
Blue Springs	.....	.....	.....	0.94	8.8
Boonville	.....	.....	.....	1.39	9.0
Brunswick	64	—29	17.4	1.78	16.6
Cape Girardeau	.....	.....	.....	1.48	7.9
Carrollton	65	—34	19.6	1.85	17.5
Caruthersville	66	— 2	30.8	2.38	4.0
Conception	65	—29	16.6	0.78	6.0
Darksville	62	—28	18.6	1.80	14.0
Dean	68	—24	27.3	1.25	10.5
De Soto	66[d]	—20[d]	27.8[d]	0.49	5.3
Doniphan	65	— 9	28.8	2.48	11.0
Downing	.....	.....	.....	1.64	14.0
Fairport	.....	.....	.....	1.66	18.0
Fayette	63	—25	17.8	2.40	22.5
Fulton	63[c]	—26[c]	17.6[c]	0.95	9.5
Gallatin[*1]	64	—22	21.6	2.22	16.3
Gano	66	—21	25.2	1.65	11.4
Glasgow	63	—23	21.2	1.77	18.5
Goodland	65	—19	24.0	1.47	9.7
Grant City	68	—27	17.9	1.09	9.0
Harrisonville	67	—26	18.2	1.85	17.3
Hazlehurst	.....	.....	.....	1.95	14.5
Hermann	.....	.....	.....	0.94	12.0
Houston	64	—19	24.7	2.08	12.3
Huntsville	65	—26	20.6	1.29	11.5
Ironton	68	—18	24.2	1.49	8.5
Jackson	69	—11	26.6	1.66	10.5
Jefferson City	65	—23	19.4	1.01	7.6
Joplin	63	—21	25.9	1.33	13.5
Kidder	66	—28	18.5	1.68	9.4
Koshkonong	66	—16	27.4	1.33	9.0
Lamar	66	—28	23.0	1.65	18.0
Lamonte	.....	.....	.....	0.47	10.0
Lebanon	62	—22	24.3	1.65	14.5
Lexington	67	—24	21.4	1.85	15.0
Liberty	67	—25	20.4	1.93	13.7
Lockwood	65	—30	22.4	2.00	13.5
Louisiana	63	—23	19.7	1.49	.....
Macon	65	—28	19.9	1.52	14.2
Marblehill	67	—12	27.1	1.61	6.6
Marshall	64	—26	19.4	1.52	16.8
Maryville	65	—25	15.5	1.60	15.8
Mexico	64	—25	20.2	1.30	11.9
Miami[*5]	61	—26	19.8	2.07	19.1
Monroe	60	—28	17.0	1.34	10.8
Montreal	66	—26	23.2	1.41	13.1
Mountaingrove	60	—21	23.7	1.78	11.5
Mount Vernon	66	—26	24.0	1.45	13.0
Neosho	67	—29	25.4	1.86	14.0
New Haven	65	—19	23.1	1.55	11.5
New Madrid	.....	.....	.....	2.22	.....
New Palestine	63	—22	22.0	1.69	15.9
Oakfield	65	—21	23.9	1.19	7.8
Olden	65	—18	26.4	1.66	12.0
Oregon	68	—27	18.6	1.35	13.8
Osceola	.....	.....	.....	2.59	.....
Pine Hill	.....	.....	.....	1.79	10.0
Princeton	65	—28	18.5	3.10	29.5
Protem	66[c]	—17	29.6	.....	.....
Rockport	.....	.....	.....	2.37	15.0
Rolla	.....	.....	.....	1.64	13.1
St. Charles	66	—24	21.9	1.71	10.0
St. Joseph	.....	.....	.....	1.33	9.0
Sarcoxie	.....	.....	.....	1.70	10.6
Sedalia	62	—27	21.5	1.51	13.2
Seymour	62	—23	22.9	1.73	13.0
Sikeston	65	— 6	29.0	1.95	8.3
Steffenville	60	—28	18.3	1.39	16.0
Sublett	62	—31	15.6	3.62	16.5
Trenton	62	—25	18.7	1.83	15.0
Unionville	62	—28	13.2	2.45	17.1
Versailles	68	—28	23.0	1.64	15.4
Warrensburg	66	—26	21.8	1.98	19.4
Warrenton	58	—21	18.5	1.09	8.7
Warsaw	66	—40	19.8	1.38	14.5
Wheatland	.....	.....	.....	2.10	16.0
Willowsprings	64	—22	24.4	1.40	6.5

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Windsor	65	−30	18.9	1.98	16.9
Zeitonia	63[b]	−14	22.4[d]	1.30	9.0
Montana.					
Adel	56	−51	18.8	0.55	5.5
Alzada				T.	T.
Anaconda	56	−33	21.3	0.40	4.0
Augusta	65	−43	18.6	0.40	4.0
Billings	68	−32	22.2	0.30	3.0
Boulder	60	−35	17.0	0.16	2.0
Bozeman	56	−33	16.8	0.75	4.0
Butte	55	−29	21.5	0.10	1.0
Canyon Ferry	63	−33	15.9	0.37	5.8
Cascade	63	−38	22.3	0.31	9.0
Chester	62	−44	10.3	0.60	
Chinook	65	−50	8.6	0.08	
Choteau	64	−34	19.9	0.12	2.4
Clearcreek	62	−31	19.5		
Columbia Falls	52	−35	18.5	0.93	
Crow Agency	63	−38	14.4	0.30	3.0
Culbertson	59	−46	9.8	0.47	
Dayton	63	−26	22.3	0.65	6.5
Decker	64	−48	16.0	T.	
Deerlodge	54	−35	16.2		
Dillon	60	−31	20.5	0.14	1.3
Fallon	64	−47	10.4	0.50	
Forsyth	66	−46	13.6	0.30	3.0
Fort Benton	59	−44	11.8		
Fort Harrison	62	−37	16.1		
Fort Logan	54	−46	13.2	0.55	5.5
Glasgow	50	−53	2.7	0.22	
Glendive	60	−47	7.8	0.70	7.0
Grayling	47[c]	−60	8.5[b]	0.34	4.2
Greatfalls	62	−30	20.2	0.17	
Hamilton	65	−28	23.6	0.30	6.0
Hayden (near)	58	−39	18.5	0.66	3.0
Jordan	66	−55	12.2	0.50	5.0
Lakeview				0.30	3.0
Lame Deer	65	−40	15.0	0.74	4.4
Livingston	63	−32	24.4	0.45	3.0
Lewistown	65	−33	20.2	1.00	10.0
Lodgegrass	60	−38	11.0	T.	0.8
Martinsdale	59[d]	−28	18.1[d]	0.30	
Marysville	53	−31	17.6	0.30	3.0
Missoula	65	−27	22.4	0.20	1.5
Ovando	53	−46	13.4	0.63	3.5
Parrot	58[c]	−31	15.0[c]	0.11	
Philipsburg	61	−36	21.4	0.06	0.6
Plains	60	−21	21.6	0.20	2.0
Poplar	61	−44	11.2		
Raymond				0.20	2.0
Redlodge	62	−31	19.4	0.11	3.0
Ridgelawn	63	−42	7.7	1.00	4.0
St. Pauls				0.00	
St. Peter	57	−29	22.8	0.31	5.5
Saltese				1.70	14.0
Springbrook	61	−42	13.0	0.67	6.4
Toston	68	−32	17.2	T.	T.
Troy	60	−22	24.3	1.66	5.0
Twin Bridges	65	−32	22.2	0.10	T.
Utica	66	−34	24.0	0.16	
Virginia City	52	−30	18.9	0.15	2.0
Warrick				1.10	10.1
Wolf Creek	59	−40	20.0	0.50	8.5
Yale	63	−33	18.8	0.30	3.0
Nebraska.					
Agate	58	−35	12.6	0.19	5.4
Agee[e1]	57	−38	11.9	0.57	5.8
Albion				0.80	8.0
Alliance	74	−35	17.8	0.10	1.0
Alma	66	−36	17.6	0.34	4.2
Ansley	64	−27	14.2	1.00	10.0
Arapaho				0.55	6.0
Arcadia				0.50	5.0
Ashland *a*	68	−33	15.4	0.70	13.8
Ashton				0.08	
Auburn	69	−35	17.1	1.08	14.5
Aurora	65	−23	16.0	0.68	10.0
Bartley	67	−30	18.6	0.58	5.2
Beatrice	73	−32	19.2	1.07	12.5
Beaver	67	−23	20.1	0.67	7.0
Bellevue				1.15	13.0
Blair	65	−33	15.4	0.78	12.9
Bluehill				1.05	10.5
Bradshaw				0.87	8.8
Bridgeport	63	−34	14.2	1.10	11.0
Broken Bow	67	−41	17.8	1.10	11.0
Burchard				1.32	13.2
Burge				0.46	4.5
Burwell				1.20	12.0
Callaway	68	−31	15.8	0.50	5.0
Central City				0.50	5.0
Chester				1.20	12.0
Cody				0.36	3.7
Columbus	67	−29	12.0	0.55	7.5
Crawford				0.04	1.0
Crete	68	−27	16.2	0.68	8.6
Culbertson	65	−28	20.4	0.50	
Curtis	64	−32	16.0	0.60	6.0

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
David City	64	−29	14.4	0.86	12.3
Dawson	69	−28	17.9	0.74	7.2
Duff				0.45	4.5
Dunning				0.40	4.0
Edgar				1.50	15.0
Ericson				1.10	11.0
Ewing				1.00	10.0
Fairbury	72	−35	16.0	0.74	12.5
Fairmont	58	−34	12.5	1.20	12.0
Fort Robinson	61	−21	17.4	0.02	0.2
Franklin	69	−33	17.2	0.65	6.5
Fremont	65	−31	13.9	0.95	9.5
Fullerton				1.25	12.5
Geneva	69	−31	16.5	1.90	19.0
Genoa (near)	65	−32	13.8	0.69	10.0
Gering	62	−32	17.5	0.65	6.5
Gordon				0.05	0.5
Gothenburg	70	−30	17.2	1.40	14.0
Grand Island *a*	68	−25	16.7	1.55	18.7
Grant	63	−25	16.1	0.51	
Greeley				0.50	5.0
Guide Rock				1.18	11.8
Haigler				0.37	
Halsey	67	−32	14.9	0.18	
Hartington	64	−31	13.6	1.02	10.2
Harvard	66	−31	13.9	0.64	6.4
Hastings[e1]	58	−26	17.6	1.50	15.0
Hayes Center				1.50	15.0
Hay Springs	60	−35	13.6	0.35	3.5
Hebron	69	−32	16.5	1.00	10.0
Hendley				0.80	8.0
Hickman				1.12	11.2
Holbrook				1.33	11.0
Holdrege	65	−28	18.6	1.70	17.0
Holly				0.17	1.8
Hooper[e1]	60	−26	15.1	0.59	8.2
Imperial	64	−24	17.0	0.93	19.2
Johnstown				0.50	5.0
Kearney	63	−25	15.1	0.87	10.2
Kennedy	70	−33	16.9	0.40	4.0
Kimball	58	−27	17.8	1.20	12.0
Kirkwood	68	−36	15.8	0.50	5.0
Leavitt	70	−31	15.4	0.90	9.0
Level				0.55	5.5
Lexington	68	−34	15.5	1.00	10.0
Lodgepole	61	−24	16.6	0.30	3.0
Loup	63	−32	15.4	0.40	9.5
Lynch	70	−42	15.2	0.16	1.6
McCook				0.94	8.1
McCool				1.10	
Madison	66	−28	14.4	0.90	10.0
Marquette				0.88	8.8
Mason				0.90	9.0
Merriman				0.30	3.0
Minden	66	−31	15.0	1.06	12.8
Monroe				0.60	9.3
Nebraska City	68	−27	16.6	1.53	15.8
Nemaha				1.30	13.0
Norfolk	69	−35	13.8	0.72	10.5
North Loup	71	−33	14.0	0.79	8.0
Oakdale	65	−31	12.4	0.58	6.1
Odell				1.25	12.5
O'Neill	67	−34	16.8	0.30	3.2
Ord				0.76	
Palmer				0.60	8.0
Palmyra[e1]	68	−29	17.2	0.78	
Pawnee City	69	−28	17.0	0.98	11.0
Plattsmouth *b*				1.92	18.5
Plymouth				1.20	
Purdum	66	−34	15.2	0.70	7.0
Ravenna *a*	68	−29	15.4	0.98	9.8
Redcloud				0.65	6.5
Republican				1.70	17.0
Rulo				1.25	12.5
St. Libory				0.90	9.0
St. Paul	68	−32	15.0	0.86	8.5
Santee	68	−38	14.7	0.25	2.5
Schuyler				1.35	13.5
Seward	67	−26	17.2	1.17	16.5
Smithfield				1.35	13.5
Springview	65	−30	15.8		
Stanton	65	−35	13.6	0.65	6.5
Strang				1.10	11.0
Stratton				0.95	
Superior	66	−31	14.7	1.10	11.0
Syracuse				1.55	15.5
Tablerock				1.22	12.5
Tecumseh				1.12	14.2
Tekamah	68	−33	14.6	1.45	14.5
Turlington	68	−29	16.1	1.70	17.0
University Farm	70	−26	15.8	0.85	13.7
Wahoo				1.40	14.0
Wakefield	66	−38	13.2	0.83	8.3
Wallace				0.80	8.0
Wauneta				0.60	6.0
Weeping Water				1.29	19.0
Westpoint	68	−33	14.2	0.77	7.7
Whitman				0.30	3.0

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Wilber				0.65	12.0
Wilsonville				0.95	9.5
Winnebago	69	−45	12.6	0.99	9.2
Wisner				0.90	11.0
Wymore				1.40	14.0
Nevada.					
Amos	70	−9	33.1	0.60	
Battle Mountain	78	−13	38.6	0.40	
Belmont	52	9	30.7	0.69	7.0
Beowawe[e1]	62	−10	37.3		
Caliente				1.50	3.0
Candelaria	66	7	37.6	0.40	4.0
Carson City	66	8	36.4	1.43	8.1
Cranes Ranch				0.71	3.9
Dyer	66	0	37.8	0.50	
Elko	70	−17	36.0	0.77	0.2
Eureka	60	−23	32.1	2.60	18.3
Geyser	58	−12	31.8	1.73	2.5
Golconda				1.25	
Halleck[e5]	60	−16	31.7	0.55	0.5
Humboldt	61	2	34.6	0.28	4.0
Lewers Ranch	65	4	37.0	4.45	19.7
Lovelocks	60	−3	35.6	0.40	4.0
Martins	73	10	38.7	1.96	6.0
Mill City[e1]	60	10	35.4	0.40	
Palisade	63	−15	33.8	1.12	
Palmetto	60	−3	32.4	2.35	19.0
Pioche	59	−7	30.4	2.89	14.0
Potts	55	−16	28.2	1.15	8.5
Reno State University	64	8	36.5	1.29	
San Jacinto	58	−17	28.5	0.14	T.
Sodaville		28		0.00	
Tecoma	58	−4	28.4	0.48	2.5
Toano[e5]	64	−28	26.0	2.20	22.0
Wadsworth	71	2	36.6	0.80	4.0
Wells[e1]	53	−37	27.8	0.80	8.0
Wood	59	−24	30.4	1.25	6.5
New Hampshire.					
Alstead	38	−17	14.0	0.80	8.0
Berlin Mills	44	−26	11.2	0.57	6.0
Bethlehem	35	−13	11.6	1.00	10.0
Brookline[e1]	42	−14	18.6	1.20	12.2
Chatham	43	−16	13.0	1.10	9.0
Durham	45	−9	17.9	1.73	10.0
Franklin Falls	43	−12	16.4	1.63	18.2
Grafton	39	−12	13.2	1.15	12.0
Hanover	39	−15	13.2	1.16	11.8
Keene	42	−15	14.4	1.30	14.2
Nashua	43	−14	17.6	1.57	13.0
Newton	46	−8	18.0	1.65	12.0
North Woodstock				0.86	
Plymouth	37	−16	15.2	1.52	17.8
Stratford	40	−25	10.5	0.85	9.0
New Jersey.					
Asbury Park	48	2	25.2	1.90	5.3
Bayonne	50	0	23.2	2.48	4.7
Belvidere	51	−5	21.0	1.49	11.5
Bergen Point	45	0	23.0	2.66	11.2
Beverly	52	−2	24.3	2.54	5.2
Blairstown	47	−8	20.2		
Bridgeton	50	−3	26.0	3.96	2.0
Canton				3.44	
Cape May C. H.	47	3	27.5	2.81	4.0
Charlotteburg	43	−6	19.3	2.02	9.0
Chester	49	−4	21.1	1.84	9.0
Clayton	49[d]	−3[d]	23.4[d]	3.85	3.0
College Farm	47	−5	22.4	2.59	8.8
Dover	44	−2	19.8	1.75	8.0
Elizabeth	48	−1	24.3	2.58	
Englewood	42	−2	22.4	3.05	10.5
Flemington	57	−6	24.3	2.05	10.0
Friesburg	47	−1	24.7	3.45	4.0
Hightstown	52	−5	22.4	2.34	11.5
Imlaystown	46	−3	24.5	2.69	5.4
Indian Mills	50	−3	25.4	3.82	7.2
Lakewood	46	−3	24.6	3.31	5.5
Lambertville	47	−2	22.7	2.45	12.0
Layton	45	−17	16.8	0.87	7.5
Moorestown	45	−1	24.2	2.79	8.8
Newark	44	1	23.2	2.13	9.8
New Brunswick	53	−1	24.2	2.79	10.0
Newton	42	−9	18.7	1.67	8.5
Oceanic	44	0	24.6	2.95	5.2
Paterson	48	4	25.2	2.54	8.1
Phillipsburg	47	−2	21.6	2.20	11.8
Plainfield	46	−4	22.5	2.54	7.6
Pleasantville				2.62	T.
Rancocas				2.66	5.5
Rivervale	42	−18	19.2	2.37	16.0
Sandyhook	45	4	24.3	2.86	9.0
Somerville	47	−5	23.1	1.79	8.0
South Orange	44	2	22.8	2.15	10.5
Sussex	45	−12	19.4	0.87	8.5
Trenton	51	3	28.2	2.15	5.0
Tuckerton	44	−4	24.8	3.88	3.5
Vineland	50	−4	25.2	3.98	2.0
Woodbine	47	−1	26.6	3.70	2.0
Woodstown				1.94	7.0

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Mexico.	°	°	°	*Ins.*	*Ins.*
Alamagordo	71	15	45.6	2.45	6.0
Albert	66	−10	30.4	1.12	11.0
Albuquerque	62	6	35.3	.....	.....
Alma	69	12	43.8	6.05	.....
Arbela	64	−24	34.6	1.90	19.0
Bellranch	70	−18	34.8	1.15	11.5
Bloomfield	60	1	36.0	1.15	1.8
Brice	72	15	46.1	1.63	2.5
Cambray	.....	.....	.....	2.01	4.0
Carlsbad	76	− 5	37.8	2.00	17.8
Cimarron	63	−35	28.0	0.83	7.0
Cloudcroft	48	− 4	28.4	4.05	24.0
Deming	68	13	43.0	2.08	7.0
Dorsey	61	−19	28.3	0.51	7.0
Eagle Rock Ranch	62	−18	29.2	0.37	5.3
Elizabethtown	45	−26	22.9	1.83	12.5
Elk	66	− 4	37.0	1.94	19.0
Engle	66	10	41.8	1.40	2.0
Estancia	57	−2	30.7	0.94	10.5
Fairview	65	7	42.7	0.38	3.0
Fort Bayard	63	11	38.8	4.26	5.0
Fort Stanton	64	− 3	33.9	1.32	13.2
Fort Union	64	−27	33.6	1.90	19.0
Fort Wingate	69	−14	34.0	2.31	.....
Fruitland	.....	.....	.....	1.15	3.5
Gage	.....	.....	.....	3.00	4.0
Hillsboro	66	12	43.0	2.86	2.0
Las Vegas	60	−31	31.7	1.84	18.0
Lordsburg	73	18	47.5	3.35	3.2
Los Lunas	63	9	37.5	2.40	7.5
Luna	59	− 6	33.5	3.53	13.5
Mesilla Park	73	16	46.0	1.26	1.5
Mineral Hill	.....	.....	.....	2.63	23.5
Mountainair	62	− 7	32.6	1.64	21.0
Portales	67	− 7	30.0	1.46	12.9
Raton	61	−18	29.4	0.85	8.5
Rociada	59	−14	34.0	2.52	19.8
San Marcial	69	12	43.6	.....	.....
San Rafael	62	− 1	36.4	1.06	5.0
Socorro	64	10	40.4	1.11	9.0
Springer	63	−23	39.2	0.60	6.0
Strauss	.....	.....	.....	0.96	5.0
Taos	52	−14	29.0	2.09	16.0
Tucumcari	66	−11	31.2	1.15	11.5
Vermejo	61	−18	28.3	1.05	10.5
Willis	57	−11	28.4	4.15	41.5
New York.					
Adams	.....	.....	.....	2.54	26.0
Addison	48	−14	18.6	0.52	3.5
Akron	.....	.....	.....	2.49	.....
Alden	40	−13	17.4	1.49	14.9
Ames	45	−11	16.5	1.20	13.0
Amsterdam	40	−10	17.6	1.60	21.5
Appleton	42	−10	18.8	0.96	.....
Arcade	46	−15	14.2	2.00	23.0
Athens	44	− 7	18.2	0.98	7.0
Atlanta	43	−15	18.0	1.25	12.5
Atwater	.....	.....	.....	0.46	7.0
Auburn	48	− 9	18.7	1.62	12.0
Avon	41	−14	15.7	0.49	5.5
Baldwinsville	42	−14	17.1	2.95	29.5
Ballston Lake	43	−11	13.9	1.13	13.4
Bedford	46	− 3	20.2	1.82	9.2
Berlin	39	−18	13.5	0.60	6.0
Blue Mountain Lake	.....	.....	.....	1.30	13.0
Bolivar	47	−19	16.6	0.85	10.5
Bouckville	36	− 8	14.8	2.13	18.5
Brockport	44	− 8	19.2	2.34	21.0
Cape Vincent	38	−20	10.8	1.80	.....
Carmel	38	− 8	17.0	1.77	14.0
Carvers Falls	41	−25	10.9	1.19	16.0
Chatham	40	− 6	17.2	1.04	8.0
Chazy	40	−12	12.4	0.35	3.5
Coeymans	41	− 7	16.0	0.65	6.5
Cold Spring Harbor	40	− 5	20.6	2.69	.....
Cooperstown	35	−16	13.8	2.04	20.5
Cortland	37	−14	16.4	0.96	8.3
Cutchogue	45	4	23.4	1.40	7.0
Dekalb Junction	38	−17	10.3	1.67	25.0
De Ruyter	39	−16	15.4	1.55	15.5
Easton	.....	.....	.....	1.24	14.0
Elba	40	−10	16.0	2.90	24.0
Elmira	47	− 6	20.6	.....	.....
Faust	36	−31	9.8	2.14	22.0
Fayetteville	42	−12	17.3	2.23	21.0
Fort Plain	40	− 9	17.0	1.51	19.3
Franklinville	43	−22	14.8	1.66	16.6
Gabriels	39	−32	8.1	1.50	17.5
Gansevoort	.....	.....	.....	2.40	24.0
Glens Falls	36	−21	12.3	2.08	20.8
Gloversville	40	−19	13.0	2.15	26.5
Greenfield	41	−15	12.8	2.20	22.0
Greenwich	38	−19	13.3	1.40	14.0
Griffin Corners	44	−15	14.6	0.86	8.5
Harkness	42	−10	14.0	0.24	3.7
Haskinville	.....	.....	.....	1.25	12.5
Hemlock	40	− 8	18.2	0.50	.....
Hunt	44	−19	16.8	0.40	4.0
Indian Lake	46	−23	12.6	1.52	20.4
Ithaca	41	− 6	18.4	0.71	8.1
Jamestown	44	−17	16.8	1.80	18.0
Jeffersonville	49	−17	15.3	1.38	13.0
Keene Valley	42	−16	13.4	0.62	5.5
Lake George	41	−18	12.4	2.18	21.6
Le Roy	42	− 8	17.5	1.76	14.3
Liberty	43	−10	15.2	1.29	11.6
Littlefalls, City Res.	38	−10	14.4	0.98	17.0
Lockport	38	− 8	17.8	1.40	.....
Lowville	39	−19	11.8	2.16	24.0
Lyndonville	.....	.....	.....	1.35	10.6
Lyons	44	−10	18.8	1.65	16.5
Middletown	40	− 4	18.9	1.25	8.9
Mohonk Lake	36	− 6	15.8	1.05	11.0
Moira	38	−12	11.6	3.80	38.0
Mt. Hope	44	− 7	26.2	1.20	7.0
Newark Valley	.....	.....	.....	0.83	9.5
New Lisbon	38	−22	12.8	1.00	10.0
North Hammond	34	−20	7.6	2.25	22.5
Ogdensburg	38	−21	13.0	1.13	13.6
Old Chatham	.....	.....	.....	0.38	4.0
Oneonta	44	−15	17.6	1.00	10.0
Oswegatchie	.....	.....	.....	2.20	19.0
Otto	55	− 7	17.0	0.80	.....
Oxford	37	−19	15.6	1.92	19.2
Oyster Bay	49	5	24.9	1.93	7.9
Palermo	.....	.....	.....	4.22	42.2
Perry City	49	−12	16.0	0.94	9.2
Plattsburg	45	− 9	14.2	1.00	10.0
Port Jervis	50	− 9	19.1	2.00	12.0
Potsdam	38	−17	11.0	1.98	18.5
Redhook	.....	.....	.....	1.55	.....
Richland	40	−21	15.0	3.30	33.0
Richmondville	44	−10	16.2	2.17	7.5
Ridgeway	40	− 8	17.6	1.91	15.9
Ripley	41	−10	20.4	2.50	16.0
Romulus	41	− 5	19.5	0.46	4.5
Salisbury Mills	.....	.....	.....	1.29	6.0
Saranac	38	−25	12.4	0.33	5.3
Scarsdale	43	0	21.3	1.95	10.5
Setauket	41	6	23.4	2.40	5.4
Shortsville	41	− 6	18.3	1.16	7.6
Skaneateles	.....	.....	.....	1.88	.....
Southampton	44	4	24.0	2.65	6.6
South Canisteo	42	−15	16.4	1.30	8.7
South Kortright	42	−23	14.8	0.83	11.4
South Schroon	37	−15	12.3	1.66	18.0
Spier Falls	40	−17	13.1	1.60	21.0
Ticonderoga	39	−17	13.1	1.37	15.0
Volusia	44	−14	16.8	1.49	9.0
Wappinger Falls	40	−22	15.2	1.85	15.0
Warwick	.....	.....	.....	1.36	14.0
Watertown	38	−14	13.5	1.15	14.0
Waverly	45	−14	18.8	0.58	5.8
Wedgwood	38	− 9	16.8	0.83	11.5
Wells	.....	.....	.....	2.25	22.3
West Berne	50	−13	16.8	1.30	13.0
Westfield	41	−12	18.4	2.15	8.0
Windham	39	−18	16.4	0.53	4.5
North Carolina.					
Brewers	56	1	31.4	4.75	.....
Bryson City	.....	.....	.....	7.76	8.0
Catawba	.....	.....	.....	4.84	6.5
Chapelhill	56	6	33.1	7.29	5.0
Currituck	.....	.....	.....	4.34	1.0
Eagletown	50	14	33.2	4.95	1.1
Edenton	61	12	35.6	6.20	2.0
Fayetteville	62	12	37.1	5.46	3.5
Goldsboro	59	14	35.8	5.91	T.
Graham	.....	.....	.....	5.68	4.4
Greensboro	58	6	32.8	3.42	4.5
Henderson	53	8	32.6	5.14	4.2
Hendersonville	58	− 3	32.2	5.86	6.5
Henrietta	69	4	34.6	6.13	8.0
Horse Cove	56	0	32.9	7.94	11.0
Jefferson	51	− 4	27.8	4.42	9.1
Kinston	65	15	38.1	5.06	4.0
Lenoir	60	2	32.6	4.18	3.0
Lexington	59	2	31.8	5.99	8.1
Lincolnton	63	3	33.2	.....	7.5
Linville	44	− 8	26.0	6.05	14.0
Littleton	56	7	31.5	.....	.....
Louisburg	53	11	33.2	5.84	1.8
Lumberton	62	15	37.6	5.53	2.5
Manteo	56	14	36.8	7.70	4.4
Marion	60	0	33.4	7.69	10.7
Marshall	54	− 8	32.4	2.45	8.8
Moncure	58	10	34.8	6.40	T.
Monroe	62	6	35.0	5.32	3.5
Morganton	59	2	32.4	6.90	8.5
Mount Holly	.....	.....	.....	5.34	3.0
Murphy	.....	.....	.....	6.74	7.5
Nashville	57	11	34.6	5.93	0.2
Newbern	66	15	40.4	6.54	4.5
Patterson[a 1]	54	6	29.1	4.03	7.0
Pinehurst	59	10	35.9	5.29	2.0
Pittsboro	58	9	34.2	5.17	2.8
Randleman	.....	.....	.....	5.42	2.3
Reidsville	54	2	31.6	4.78	4.8
Rockingham	60	12	36.8	.....	.....
Rocky Mount	.....	.....	.....	6.27	0.2
Salem	57	0	31.6	5.71	.....
Salisbury	61	6	32.6	5.95	5.5
Saxon	54	0	31.8	4.54	8.0
Scotland Neck	57	14	35.3	5.97	1.5
Selma	58	12	34.8	7.80	.....
Settle	64	1	34.6	5.53	10.4
Sloan	66	12	35.4	5.23	2.4
Southern Pines	67	10	36.2	6.43	2.7
Southport	65	16	42.4	7.26	.....
Statesville	61	− 3	32.4	5.70	2.5
Tarboro	60	14	36.0	6.79	1.0
Washington	67	14	40.6	6.41	4.5
Weldon	55	11	32.7	5.48	0.6
Whiteville	63	16	39.0	5.91	1.2
North Dakota.					
Amenia	56	−31	10.0	0.13	1.3
Ashley	50	−46	3.8	0.80	8.0
Berlin	60	−40	8.8	0.40	4.0
Bottineau	.....	−37	.....	0.05	0.5
Cando	53	−40	5.6	0.30	3.0
Churchs Ferry	61	−35	7.6	T.	T.
Coalharbor	57	−39	8.2	0.81	8.1
Cooperstown	55	−38	8.2	0.05	0.5
Dickinson	63	−41	10.2	0.49	3.0
Donnybrook	56	−36	8.6	0.40	4.0
Dunseith	49	−36	6.0	.....	.....
Edgeley	60	−35	10.6	0.17	2.7
Ellendale	60	−34	10.	0.20	2.0
Fargo	59	−34	7.0	0.20	2.0
Forman	64	−36	10.6	0.60	6.0
Fort Berthold	60	−44	10.3	0.25	2.5
Fort Yates	60	−41	12.1	0.68	6.2
Fullerton	58	−37	10.0	0.65	6.5
Glenullin	58	−37	10.9	0.53	2.3
Grafton	54	−32	6.8	0.45	4.5
Hamilton	50	−38	5.8	0.33	3.3
Hannaford	55	−39	8.3	T.	T.
Jamestown	60	−39	10.2	0.25	2.5
Kulm	58	−38	10.2	0.24	2.2
Langdon	49	−38	4.4	.....	.....
Larimore	57	−30	9.4	0.10	1.0
Lisbon	61	−36	10.6	0.10	1.0
McKinney	55	−42	5.9	0.05	0.5
Manfred	54	−37	8.0	0.20	2.1
Mayville	55	−32	10.8	0.05	0.5
Medora	68	−46	7.8[c]	0.40	4.0
Melville	52	−32	8.8	T.	T.
Milton	52	−36	7.2	T.	T.
Minnewaukon	54	−33	8.1	.....	.....
Minto	55	−35	6.2	0.25	2.5
Napoleon	48	−45	5.2	0.45	4.5
Oakdale	59	−32	12.0	0.80	8.0
Palermo	.....	.....	.....	0.46	4.6
Park River	.....	.....	.....	0.04	0.4
Pembina	45	−37	2.0	0.26	2.6
Portal	40	−38	5.8	0.40	4.0
Power	60	−37	8.8	0.35	3.5
Rolla	56	−34	6.4	0.17	1.7
Rugby	52	−38	6.0	0.10	1.0
Sentinel Butte	61	−37	10.8	0.45	3.0
Steele	47	−43	3.5[d]	0.50	5.0
University	54	−30	10.2	0.13	1.3
Wahpeton	58	−30	13.8	0.35	3.5
Walhalla	56	−40	6.0	T.	T.
Washburn	60	−38	10.4	0.55	5.5
Westhope	60	−38	6.2	0.37	3.7
Willow City	56	−43	4.2	0.10	1.0
Wishek	46	−43	6.2	0.60	6.0
Ohio.					
Akron	41	−12	18.2	1.45	8.5
Amesville	47	−13	24.9	1.55	3.2
Atwater	.....	.....	.....	1.71	5.0
Bangorville	40	−15	19.0	1.30	6.0
Bellefontaine	42	−16	17.9	1.19	6.8
Benton Ridge	41	−14	19.8	1.52	12.2
Bowling Green	36	−15	17.4	1.62	12.5
Bucyrus	37	−17	19.0	0.67	.....
Cadiz	39	−12	21.4	1.95	8.7
Cambridge	43	−11	23.4	0.78	3.0
Camp Dennison	45	− 6	24.2	2.03	5.5
Canal Dover	39	−20	20.0	2.54	5.0
Canton	39	−10	20.1	1.51	9.2
Cardington	38	−20	18.2	1.26	6.6
Circleville	42	− 8	23.0	1.51	5.0
Clarington	45	− 9	25.2	1.95	6.1
Clarksville	45	− 9	23.5	1.81	3.9
Cleveland[b]	41	−10	19.2	1.81	15.1
Coalton	46	−12	24.4	1.75	2.4
Colebrook	40[c]	−13[c]	19.3[c]	1.35	5.0
Dayton	47	− 9	22.1	1.90	7.1
Defiance	43	−16	18.2	1.52	15.1
Delaware	40	−15	19.6	1.56	6.1
Demos	41	−10	21.8	1.78	6.4
Findlay	43	−13	18.7	1.90	10.0

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Frankfort	44	— 8	24.7	1.93	3.2
Fremont	41	—14	20.2	1.60	12.3
Garrettsville	42	—14	18.2	1.68	7.3
Granville	40	—12	21.4	1.63	6.9
Gratiot	41	—12	21.6	1.62	3.4
Green	49	— 6	25.4	2.64	5.0
Greenfield	43	— 6	24.5	1.69	5.5
Greenhill	40	—18	18.2	1.63	5.4
Greenville	47	—15	19.7	1.56	9.0
Hedges	44	—17	18.9	1.16	8.6
Hillhouse	40	—17	17.3	1.33	9.0
Hiram	40	—14	18.2	1.38	9.0
Hudson	52	—16	18.4	2.45	12.5
Ironton	49	— 4	28.1	2.16	5.9
Jacksonburg	45	—10	21.4	2.27	8.0
Kenton	41	—15	18.6	1.36	5.3
Killbuck	40	—12	19.8	1.37	3.6
Lancaster	43	—10	22.4	1.72	4.5
Lima	42	—16	19.2	2.07	6.0
McConnelsville	46	— 8	23.8	0.56	2.1
Manara	44	— 9	22.4	1.76	4.1
Mansfield				1.50	14.0
Marietta	51	— 6	26.8	1.63	3.0
Marion	41	—14	20.2	1.24	11.6
Medina	43	—19	17.9	1.62	6.0
Milfordton	41	—17	19.6	1.06	5.5
Milligan	48	—14	22.9	1.54	4.0
Millport	39	—22	19.0	1.52	9.1
Montpelier	40	—17	16.8	1.70	13.0
Napoleon	43	—16	18.9	1.27	7.5
Nellie	40	—11	21.1	1.39	9.5
New Alexandria	41	—11	21.0	1.45	
New Berlin	42	—15	19.4	1.35	4.5
New Bremen	43	—18	18.5	1.08	8.0
New Richmond	46	— 7	24.4	1.86	3.9
New Waterford	42	—18	19.2	0.69	6.0
North Lewisburg	42	—15	19.1	1.65	6.0
North Royalton	40	—13	18.6	1.20	8.0
Norwalk	42	—14	19.4	1.86	3.0
Oberlin	44	—13	19.4	1.30	10.2
Ohio State University	39	—14	20.4	1.49	3.2
Orangeville	43	—15	18.4	0.50	4.0
Ottawa	41	—15	18.8	1.81	17.6
Pataskala	41	—11	20.9	1.86	8.3
Philo	42	— 9	22.2	0.92	3.8
Plattsburg	39	—11	20.7	2.22	9.0
Pomeroy	45	— 5	25.8		
Portsmouth	46	— 4	26.8	2.02	3.8
Pulse	43	—10	22.8	2.11	5.4
Rittman	45	—14	18.1	0.54	2.0
Rockyridge	38	—15	18.4	0.95	7.0
Shenandoah	54	—15	17.8	1.17	9.1
Sidney	46	—15	20.2	1.49	8.0
Somerset	42	—10	22.6	1.22	7.5
South Lorain	43	—14	19.3	1.50	10.0
Springfield				1.73	6.1
Thurman	45	— 8	25.4	1.79	5.0
Tiffin	39	—14	19.7	1.93	13.8
Upper Sandusky	39	—15	19.7	1.68	8.8
Urbana	44	—16	18.5	1.32	4.0
Vickery	38	—15	18.0	1.30	7.7
Warren	38	—11	19.4	1.85	9.5
Wauseon	38	—16	17.1	1.46	14.2
Waverly	49	— 9	25.0	2.04	6.7
Waynesville	43	— 9	22.0	2.30	10.0
Wellington	43	—12	19.6	1.13	7.5
Willoughby				1.50	11.0
Wilson	48	—11	24.4	2.39	5.5
Wooster	43	—12	19.8	1.36	3.7
Zanesville				1.48	2.6
Oklahoma.					
Alva	77	—14	30.0	1.55	15.2
Arapaho	67	—16	26.9	0.75	7.0
Beaver	67	—16	24.6	0.20	2.0
Binger	67	—17	26.8	1.65	10.0
Blackburn	67	—22	29.8	6.00	12.5
Chandler	68	—19	27.0	0.91	8.0
Cleo	70	—25	28.3	0.50	5.0
Cloud Chief	64	—12	26.6	1.15	11.5
Eldorado				1.17	12.0
Enid	66	—20	25.0	0.15	1.5
Erick	71	—17	26.0	1.30	13.0
Fort Reno	66	—15	26.6	0.83	8.3
Fort Sill	68	— 5	28.0	1.20	8.0
Gage	69	—19	25.0	0.30	3.0
Grand				1.10	6.0
Guthrie	64	—14	26.8	1.79	12.0
Harrington	66	—17	25.2	1.47	10.8
Hennessey	65	—18	26.0	1.48	10.0
Hobart	65	—11	27.4	0.94	9.4
Jefferson	66	—23	24.8	0.42	4.2
Jenkins	68	—12	26.2	0.58	5.2
Kenton	67	—12	27.6	0.35	3.5
Kingfisher	68	—16	27.0	1.29	10.8
Meeker	78	—17	28.6	1.25	7.5
Newkirk	66	—21	25.2	0.50	5.0
Norman	67	—17	27.4	1.35	5.0
Okeene	65	—18	27.2	0.63	3.1
Perry	65	—20	25.6	0.80	7.9
Shawnee	68	—14	28.9	1.67	9.8
Stillwater	67	—18	23.4	1.17	11.2
Temple	68	— 5	28.8	1.83	11.5
Waukomis	67	—16	27.5	0.60	6.0
Weatherford	66	—14	25.6	0.49	4.8
Whiteagle	68	—25	25.1	0.69	8.0
Woodward				0.25	2.5
Oregon.					
Albany				2.26	
Alpha	74	16	44.2	3.98	
Arlington	68	3	35.4	0.36	
Ashland	73	23	45.2	0.43	0.5
Astoria	63	21	44.3	6.87	
Aurora (near)	71	16	41.4	1.79	0.8
Bay City	71	19	45.0	6.81	T.
Bend	66	—19	30.7	0.74	5.0
Beulah	52	—18	22.1		
Blackbutte	70	11	39.9	1.65	1.0
Blalock	68	4	36.5	0.13	
Bullrun				3.53	0.5
Burns	56	—19	24.8	0.28	4.0
Butter Creek				0.29	2.0
Cascade Locks	62	11	37.2	3.68	2.0
Coquille				3.89	
Corvallis	69	17	42.2	2.95	T.
Dayville	70	— 7	34.7	0.31	2.0
Doraville	68	12	39.9	3.07	1.3
Drain	73	15	44.0	1.56	
Ella				0.36	
Eugene	69	15	42.0	1.42	0.2
Fairview	80	22	49.6	3.42	
Falls City	65	12	40.2	4.79	T.
Forestgrove	77	11	43.8	3.20	
Gardiner	70	23	44.1	5.31	
Glendale	74	20	45.3	2.00	
Glenora	69	14	39.6	7.13	2.0
Gold Beach	73	25	48.3	5.38	
Government Camp	65	— 5	30.0	2.87	10.0
Grants Pass	74	17	46.0	1.18	
Grass Valley	66	— 6	28.8	0.20	T.
Hood River	68	2	35.4	1.22	4.0
Huntington	65	2	31.1	0.13	3.5
Jacksonville	71	17	45.9	1.08	
John Day	69	—12	32.4	0.55	1.5
Joseph	61	—20	27.2	0.42	3.0
Kerby	74	16	43.6	2.71	T.
Klamath Falls	64	5	35.7	0.85	
Lagrande	65	—14	32.2	0.71	10.0
Lakeview	64	— 7	32.7	0.73	2.0
Lonerock	72	—18	30.3	0.50	4.0
McKenzie Bridge	79	8	41.8	2.27	1.0
McMinnville	69	17	43.0	2.60	0.2
Marshfield	69	25	47.4	4.12	
Meacham				0.95	T.
Monroe	69	13	42.3	2.86	1.0
Mount Angel	73	14	43.0	2.50	T.
Nehalem				7.27	
Newport	69	19	47.0	3.42	
Ontario				0.44	5.0
Paisley	61	— 7	33.7		
Pendleton	64	— 7	32.0	0.53	1.5
Pine	52	—27	25.0	0.50	2.0
Prineville	64	—14	31.4		
Riverside	54	—20	25.3	0.55	3.0
Salem	68	18	42.5	2.08	
Silverlake	53	—21	26.8		
Sparta	56	—16	25.3	1.40	11.0
Stafford	68	14	41.4	2.03	0.5
The Dalles	64	6	36.3	0.51	0.2
Toledo	73	19	46.6	5.68	
Umatilla	68	— 1	34.9	0.24	
Vale	53	—12	23.8		
Wallowa	62	—26	26.3	0.44	4.0
Wamic	69	—19	29.0	0.30	4.0
Warm Spring	66	— 4	33.3	0.59	3.2
Weston	65	—16	29.0	1.07	8.2
Williams				1.43	T.
Pennsylvania.					
Aleppo	44	—12	23.3	1.74	5.0
Altoona	43	—10	19.2	1.44	
Beaver Dam				2.56	12.2
Bellefonte	44	— 6	22.8	1.00	10.0
Brookville				1.50	12.8
Browers				2.83	
California	47	—12	25.7	1.73	5.5
Cassandra	43	— 9	19.4	1.30	6.0
Centerhall	45	—11	20.1	1.19	12.0
Clarion				2.58	14.8
Claysville	46	—16	23.1	1.16	3.5
Clearfield				1.34	10.4
Coatsville	44	— 1	22.1	2.39	10.3
Confluence				2.22	5.5
Coudersport	42	—16	16.1		11.0
Davis Island Dam				1.65	
Derry	45	—12	22.8	1.98	4.0
Doylestown				2.43	
Dushore	45	—12	18.0	0.85	7.5
East Mauch Chunk	48	— 4	21.4	1.48	9.2
Easton	44	— 1	22.5	1.16	9.8
Ellwood Junction				2.35	
Emporium	47	—14	19.8	1.00	9.5
Ephrata	51	— 6	21.6	2.00	11.2
Everett	46	— 6	20.7	0.90	9.0
Forks of Neshaminy				2.40	
Franklin	42	—19	18.8	2.07	13.0
Freeport				2.00	
Gettysburg	49	— 5	22.5	1.41	10.5
Girardville				2.12	22.0
Gordon	49	— 8	19.8	1.95	16.0
Grampian	38	—17	18.8	0.85	8.5
Greensboro				1.54	2.0
Greenville	44	—17	19.0	2.20	15.5
Hamburg	47	— 2	23.6	1.95	6.5
Hanover	50	— 2	23.4	2.09	11.4
Herrs Island Dam				1.43	
Huntingdon	48	—10	22.1	1.08	7.5
Indiana	45	—14	20.4	1.60	11.7
Irwin	45	—10	24.4	1.47	
Johnstown	45	— 9	22.8	2.23	9.8
Keating				1.07	6.9
Kennett Square	43	0	23.6	2.58	10.5
Lansdale				2.01	
Lawrenceville	43	—14	16.6	0.70	7.0
Lebanon	49	— 4	22.4	1.91	9.2
Leroy	40	—12	17.5	0.79	5.0
Lewisburg	47	—13	19.6	1.80	9.2
Lockhaven	44	— 9	20.6	1.30	11.5
Lock No. 4				1.60	
Lycippus	43	— 8	21.8	2.26	9.2
Marion	44	— 6	21.9	1.95	17.0
Mifflin				0.65	5.9
Mifflintown	48	— 6	21.8	1.00	9.0
Milford	44	—13	18.6	1.51	7.7
Montrose	42	—11	15.6	0.45	
New Germantown	58	— 7	22.2	0.96	9.0
Oil City				2.64	13.1
Ottsville				2.26	
Parker				1.54	11.6
Philadelphia	46	6	27.2	2.73	7.4
Pocono Lake	50	—14	17.9	0.85	7.0
Point Pleasant				2.32	
Pottsville				1.87	
Quakertown	49	— 5	22.0	1.19	11.9
Reading	46	— 4	23.0	1.52	10.2
Saegerstown	44	—19	18.2	1.97	17.2
St. Marys	41	—14	16.8	1.25	12.5
Saltsburg				1.54	9.7
Seisholtzville				1.58	
Selinsgrove	44	—12	20.3	1.50	10.5
Shawmont				2.16	
Skidmore	38	—16	19.2	2.30	7.5
Smethport	45	—24	15.4		
Smiths Corners				1.87	
Somerset	46	—16	18.7	2.07	10.9
South Eaton	41	— 6	20.2	1.31	8.0
Springmount				2.00	
State College	44	—11	19.4	1.23	12.3
Towanda	40	—10	18.6	0.44	4.0
Uniontown	50	—13	23.2	1.36	
Warren	47	—17	18.8	0.98	8.4
Wellsboro	42	—12	17.8		15.5
Westchester	45	0	23.4	2.78	9.0
West Newton				2.10	6.0
Wilkesbarre	48	— 3	22.4	1.86	18.0
Williamsport	45	— 5	21.3	1.01	9.0
Rhode Island.					
Bristol	44	5	23.8	2.25	6.0
Kingston	45	— 4	21.0	2.18	8.5
Narragansett	41	0	23.4	1.26	3.0
Pawtucket	47	3	24.0	4.95	5.4
Providence	44	4	24.2	2.06	8.5
South Carolina.					
Aiken	67	8	38.9	7.25	
Allendale	56	13	37.8	6.73	
Anderson				3.70	T.
Barksdale	67	9	37.3	3.47	5.2
Batesburg	65	10	37.7	4.63	2.2
Beaufort	67	21	46.5	4.85	
Bennettsville	65	20	40.3	1.15	1.5
Blackville	67	15	40.3	8.20	
Bowman	66	18	41.0	6.11	
Calhoun Falls				4.27	6.0
Cheraw	63	14	36.6	5.63	2.5
Clarks Hill	68	8	38.6	5.99	
Clemson College	61	14	36.8	4.90	
Conway	65	17	41.3	4.45	
Dillon	65	16	39.5	5.29	6.7
Edisto				7.90	
Effingham				6.88	
Enoree				4.36	2.5
Florence	66	16	38.0	4.58	
Gaffney	65	8	35.0	4.34	5.0
Georgetown	66	19	43.8	3.72	0.4
Greenville	63	6	33.5	3.73	7.5
Greenwood	62	10	35.3	6.24	4.0

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Heath Springs	60	11	33.9	5.97	3.6
Kingstree	65	15	42.0	5.38	
Liberty	65	7	36.4	4.83	8.2
Little Mountain	65	11	37.0	5.44	1.5
Lugoff	68	11	35.1	5.66	.....
Newberry	64	13	37.7	5.63	5.5
Pelzer				5.53	6.0
St. George	68	19	41.6	4.55	
St. Matthews	65	18	39.1	7.45	4.0
St. Stephens				5.06	
Saluda	66	10	37.8	6.08	8.4
Seivern	67	10	37.7	6.38	T.
Smiths Mills				5.53	
Society Hill	61	15	37.7	4.78	1.0
Spartanburg	65	8	35.8	5.81	3.0
Statesburg	66	15	39.8	6.01	1.0
Summerville	69	19	43.1	3.72	T.
Sumter	70*	18*	43.2*	5.76	
Trenton	62	10	37.9	6.37	1.5
Trial	67	18	41.5	5.15	.....
Walhalla	70	0	37.1	5.65	3.1
Walterboro	71	19	45.2	3.83	
Winnsboro	65	13	37.5	6.30	3.0
Winthrop College	62	9	35.8	4.97	8.0
Yemassee	72	18	44.0	3.90	
Yorkville	66	10	37.5	5.33	5.5
South Dakota.					
Aberdeen	60	—37	10.6	1.30	12.0
Academy	65	—36	14.7	0.35	3.5
Alexandria	65	—38	11.0	0.20	2.0
Armour	66	—45	14.7	0.57	5.7
Ashcroft	55	—38	12.6	0.20	2.0
Bowdle	57	—38	10.9	0.50	5.0
Brookings	55	—40	8.8	1.00	10.0
Canton	63	—47	12.0	0.29	.....
Cavite	69	—48	12.2	0.28	....
Centerville				0.68	7.4
Chamberlain	65	—42	13.4	0.35	3.7
Cheyenne	65°	—45	16.1b	T.	T.
Clark	54	—40	9.1	0.65	6.5
Clear Lake	53	—32	10.6	0.41	4.1
Doland	60	—43	9.5	0.53	6.2
Elkpoint	66	—39	12.4	1.50	13.5
Fairfax	66	—32	13.9	0.20	3.0
Farmingdale				0.12	0.5
Faulkton	59	—39	11.7	0.40	7.0
Flandreau	51	—37	9.6	0.92	9.2
Forestburg	63	—44	9.6	0.80	8.0
Fort Meade	68	—31	18.2	0.21	.....
Gannvalley	63	—38	11.2	0.20	2.0
Grand River School	62	—44	11.3	0.47	5.0
Greenwood	69	—37	16.2	0.25	2.5
Herreid	59	—45	10.5	0.01	0.1
Highmore	59	—36	12.4	T.	T.
Hotch City	65	—44	10.6	0.41	5.5
Howard	59	—37	9.8	0.49	3.0
Howell	63	—43	10.0	0.16	0.8
Ipswich	59	—37	10.0	0.68	10.0
Kidder	61			0.10	2.0
Kimball	62	—38	9.8	0.20	.....
Leola	55	—36	9.0	0.80	8.0
Leslie	67	—45	13.2	T.	T.
Marion	62	—41	12.0	0.74	5.0
Menno	67	—42	12.4	0.47	5.3
Milbank	63	—31	11.0	0.15	1.0
Mitchell	67	—39	12.8	0.20	2.0
Oelrichs	60	—31	15.2	0.40	4.0
On-the-Trees Camp	63	—44	13.2	0.37	3.0
Pine Ridge	64	—39	15.2	0.05	.....
Plankinton	64	—40	12.0	0.55	.....
Ramsey	60	—48	8.6	0.30	3.0
Redfield	59	—40	7.4	0.56	5.0
Sioux Falls	63	—37	11.4	0.45	.....
Sisseton Agency	61	—31	13.0	0.16	1.6
Spearfish	62	—27	18.9	0.57	6.5
Stephan	62	—39	9.8	0.26	2.5
Tyndall	64	—41	13.1	0.29	.....
Vermillion	68	—32	14.5	0.57	8.0
Watertown	54	—38	9.0	0.72	8.0
Wentworth	57	—33	10.0	0.87	8.5
Wolsey				0.30	2.5
Tennessee.					
Andersonville	60	—15	29.6	4.15	6.0
Ashwood	63	—12	30.6	2.51	7.0
Benton	59	—28	32.2	8.65	8.5
Bluff City				4.39	4.5
Bolivar	64	— 7	30.0	3.51	7.5
Byrdstown	59	—13	31.2	3.39	7.8
Carthage	70	—10	32.6	2.86	5.0
Catlettsburg				5.98	11.0
Cedar Hill	61	— 3	29.2	2.00	6.0
Celina				2.95	.....
Charleston				8.57	13.0
Clarksville	62	— 2	29.6	2.41	6.2
Clinton				5.40	12.0
Covington	62	2	31.5	3.25	8.0
Dandridge				4.66	7.0
Decatur	64	—20	32.7	7.88	9.0
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Dickson	63	—13	29.3	3.13	5.0
Dover	66	— 2	30.3	2.30	6.0
Dyersburg	63	0	29.4	1.66	0.2
Elizabethton	53	— 8	31.0	3.73	6.2
Florence	60	—15	30.4	3.20	3.0
Franklin	64	— 9	30.2	3.10	8.0
Grace				2.00	.....
Greeneville	54	—12	32.0	5.07	9.6
Halls Hill				3.86	3.7
Harriman	62	— 3	32.4	4.91	5.0
Hohenwald	65	—23	28.9	4.24	7.0
Iron City	67	—17	32.2	6.34	9.5
Isabella	67	— 9	33.6	6.16	9.6
Jackson	65	— 3	34.9	.....	.....
Johnsonville	65	— 4	30.6	2.40	2.0
Jonesboro	58	— 4	30.6	4.75	7.5
Kenton	63	— 1	30.0	2.17	4.0
Kingston				4.03	4.5
Lafayette	63	—15	29.4	3.05	6.0
Leadvale				4.05	8.0
Lewisburg	66	—15	31.6	4.48	6.9
Liberty	63	—16	30.8	3.84	7.5
Loudon				6.25	10.0
Lynnville	64	—15	31.7	5.16	6.0
McGee				6.60	5.0
McMinnville	63	—20	32.6	4.91	7.8
Maryville	62	—14	33.2	7.53	12.5
Newport	57	—10	33.4	5.32	5.5
Palmetto	62	—15	30.8	4.31	9.0
Pope	64	— 2	32.3	3.80	6.0
Rogersville	58	—16	31.7	4.67	6.0
Rotherwood				4.48	7.0
Rugby	67	—17	29.8	4.72	8.0
Savannah	66	—10	32.9	3.49	3.5
Sewanee	59	— 8	30.0	5.73	9.5
Silver Lake	49	—11	28.0	5.66	8.4
Springdale	60	—23	31.8	4.82	10.0
Springville	65	— 2	29.9	2.50	3.8
Tazewell				4.89	12.1
Tellico Plains	63	—22	34.4	6.61	11.0
Tracy City	58	—18	30.2	7.28	9.0
Trenton	65	2	30.8	2.75	5.0
Tullahoma	63	—22	31.8	5.42	7.0
Walling				4.89	6.5
Waynesboro	65	—14	31.8	3.62	6.6
Wildersville	60	— 4	31.7	1.25	6.0
Yukon	65	—15	32.1	5.75	8.5
Texas.					
Albany	76	2	33.8	2.00	16.0
Alvin				4.64	
Arthur				3.26	6.0
Athens	80	2	42.0	1.00	0.2
Austin	78	10	42.2	2.60	T.
Ballinger	75	6	35.8	1.39	.....
Beaumont	79	17	45.3	5.68	
Beeville	79	17	45.7	3.64	
Bigspring	75	3	36.6	1.39	11.5
Blanco	65	7	37.5	1.50	.....
Boerne	76	10	42.8	1.50	T.
Bonham	72	— 1	34.4	.....	.....
Booth				4.58	
Bowie	70	— 3	32.6	2.29	10.1
Brazoria	77	15	47.2	5.88	
Brenham	74	10	41.2	4.13	
Brighton	73f	.....	48.6f	2.96	
Brownwood	81	5	39.0	1.40	1.2
Burnet	79	7	40.6	1.49	0.3
Channing	64	—15	26.0	1.20	12.0
Childress	71	—10	28.1	1.12	16.5
Clarksville				3.04	3.5
Claude	64h	—16	24.0f	1.09	10.9
Claytonville	73	— 3	33.3	1.85	.....
Coleman	80	5	38.4	0.80	T.
College Station	78	14	44.1	1.67	
Colorado	76	2	35.8	1.63	7.7
Columbia	79	17	46.7	4.47	
Columbus				3.36	
Comanche	78°	3°	36.8°	1.83	6.0
Corsicana	80	4	39.5	3.19	1.5
Cotulla	84	17	46.4	1.03	
Crockett	74	9	42.0	3.90	0.8
Cuero	75	15	44.1	4.57	
Dallas	79	2	35.2	2.81	T.
Danevang	75	15	45.8	4.32	
Decatur	79	0	33.6	1.45	4.2
Duval	79	10	43.4	1.97	T.
Eagle Pass	70	17	44.4	0.86	
Fort Brown	78	22	52.8	2.26	
Fort Clark	80	14	48.4	0.80	
Fort Davis	75	3	43.5	0.85	3.5
Fort McIntosh	85	18	50.9	1.60	
Fort Ringgold	84	21	54.5	2.72	T.
Fort Stockton	80	6	39.5	0.73	3.8
Fredericksburg	80°	7°	40.0°	0.88	T.
Gainesville	71	0	31.6	2.22	8.5
Gatesville	89	7	40.1	1.75	.....
Georgetown	83	10	41.4	2.01	T.
Gonzales	.....	.....	.....	2.88	
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Graham	74	— 1	33.6	1.76	16.5
Grapevine	76	3	37.3	1.99	4.4
Greenville	77	1	37.2	2.50	.....
Hale Center	63	— 5	31.2	1.52	15.2
Hallettsville	75	14	44.0	3.30	T.
Haskell	73	0	30.4	1.64	9.9
Hearne	79	10	39.2	3.02	T.
Hempstead				4.32	
Henrietta	70	— 3	29.3	1.85	12.6
Hereford	63	—15	23.2	1.90	17.0
Hewitt				2.20	T.
Hillsboro	81	4	37.8	3.28	.....
Hondo	77	14	45.8	1.75	
Houston	77	15	44.0	3.70	T.
Huntsville	79	11	42.8	5.34	
Jefferson	72	5	38.8	5.74	3.3
Jewett	76	8	39.4	2.17	0.5
Junction				1.20	
Kaufman	76	3	39.0	4.60	.....
Kerrville	82	9	41.7	1.62	T.
Knickerbocker	78	6	39.2	1.33	2.5
Kopperl				3.60	
Lampasas	80	8	37.7	2.30	5.8
Lapara				2.18	
Laureles Ranch				1.87	
Liberty				5.09	
Llano				1.80	T.
Longlake				2.92	0.1
Longview				2.33	0.1
Luling	76	14	42.2	1.95	
McKinney	74	1	36.8	2.19	0.4
Marlin	80	7	38.0	2.03	
Menardville	79	4	35.9	1.78	0.5
Mexia	75	5	38.3	3.10	14.5
Mount Blanco	67	— 7	27.8	1.60	16.0
Nacogdoches	75	8	41.0	3.98	
New Braunfels	76	13	43.2	2.33	
Orange				7.01	
Panter				1.94	.....
Paris	73	2	33.4	2.25	4.5
Pearsall	77	16	47.4	1.90	
Pierce	79	14	45.5	3.86	T.
Port Lavaca	74	15	45.3	3.24	T.
Quanah	65	— 6	28.6	1.30	13.0
Rhineland	70	— 2	30.7	1.50	15.0
Riverside				4.28	
Rockisland	79	13	43.8	3.77	
Rockland				4.35	
Rockport	66	22	44.0	4.82	
Runge	78*	14*	44.4*	3.50	
Sabinal	77	14	44.3	1.21	
San Saba	81	7	39.2	1.60	0.3
Santa Gertrude				3.01	
Sherman	70	3	34.7	2.62	6.5
Sonora	80	6	39.6	1.12	0.8
Sugarland	65	17	40.8	3.85	
Sulphur Springs	73	1	37.8	4.62	1.5
Templeb	81	6	38.6	1.66	T.
Texline	65	—14	25.8	0.50	5.0
Tilden	87	16	48.4	1.80	
Trinity	77	10	42.6	3.97	0.2
Tulia	67	—15	25.6	1.95	19.5
Tyler	72	4	37.2	4.22	2.0
Victoria	79	15	44.1	3.62	
Waco	81	8	40.2	3.93	
Waxahachie	80	3	35.0	3.38	0.5
Weatherford	71	1	34.1	2.20	2.0
Wichita Falls				1.80	20.0
Utah.					
Alpine				3.39	2.0
Aneth	62	5	37.0	1.71	.....
Beaver	59	—21	32.0	2.35	11.0
Blackrock	57	—26	32.3	2.26	13.1
Callao	64	—11	32.1	1.45	6.5
Castledale	45	—34	19.6	2.00	14.0
Castle Rock				1.00	9.0
Cisco	65	—15	33.0	2.40	9.0
Clear Creek				2.82	27.7
Corinne	65	— 4	33.4	0.60	1.0
Coyoto	57	—34	28.2	0.99	.....
Deseret	62	—13	33.8	1.25	5.0
Emery	50	—20	25.6	3.01	27.0
Escalante	52	— 7	29.4	2.90	9.0
Experiment Farm	72	12	44.0	.....	.....
Farmington	57	— 2	34.2	2.02	4.5
Fillmore	64	—13	36.4	2.48	.....
Fort Duchesne	43	—24	19.3	0.60	6.0
Frisco	60	—17	34.2	1.44	7.8
Giles	58	— 9	34.0	1.28	10.5
Government Creek	54	—22	31.0	1.33	3.0
Green River	65	—12	33.4	1.15	.....
Henefer	58	—25	27.0	1.37	7.8
Hite	66	6	40.2	1.52	.....
Huntsville				1.47	5.0
Ibapah	60	—12	29.1	0.82	3.2
Indianola				0.15	.....
Kanab	59	— 8	29.8	4.30	.....
Kelton	57	— 7	29.4	0.02	0.2

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
La Sal	54	—15	27.5	2.20	13.0
Levan	53	—15	29.6	2.53	7.8
Loa	48[g]	—30	24.4[g]	1.90	19.0
Logan	50	—15	26.4	1.22	.....
Manti	50	—21	28.6	3.42	15.0
Marysvale	58	—33	29.4	3.03	26.2
Meadowville	55	—22	20.7	1.25	9.0
Millville	.....	.....	.....	0.64	.....
Moab	61	—13	34.6	1.35	15.0
Morgan	52	—28	26.8	1.29	5.7
Mount Nebo	59	— 6	34.0	0.68	0.5
Mount Pleasant	53	—16	30.1	1.93	9.0
Nephi	.....	.....	.....	1.85	3.0
Ogden	57	— 9	32.5	1.71	4.0
Panquitch	.....	.....	.....	0.85	4.0
Parowan	57	—16	33.4	1.54	16.6
Payson	.....	.....	.....	0.98	0.1
Pinto	56	—20	32.0	1.88	12.8
Plateau	55	—34	28.3	1.88	20.7
Promontory[e1]	58	— 8	29.0	0.10	1.0
Provo	62	— 2	34.9	2.30	2.0
Ranch	57	—20	27.4	7.60	.....
Randolph	.....	.....	.....	0.30	3.0
Richfield	60[f]	—26[f]	31.2[f]	1.66	16.6
Rockville	.....	.....	.....	3.32	.....
St. George	73	6	44.7	2.38	.....
Salt Air	51	0	32.6	0.73	1.0
Scipio	70	—33	32.6	4.70	20.0
Snowville	64	—12	29.8	0.60	.....
Soldier Summit	48	—17[e]	22.9[e]	1.26	17.0
Sunnyside	.....	.....	.....	0.45	4.0
Thistle	61	—14	32.4	0.60	6.0
Tooele	55	— 9	32.0	1.03	.....
Torrey	49	—14	23.3	1.20	9.0
Tropic	55	— 9	31.4	2.71	26.0
Utah Lake	55	— 9	30.8	1.50	4.5
Vernal	.....	.....	.....	1.20	12.0
Wellington	50[f]	—23[f]	25.4[f]	0.10	1.0
Woodruff	51	—35	18.8	0.45	4.5
Vermont.					
Burlington	40	— 4	17.7	0.75	7.5
Cavendish	41	— 9	14.3	1.62	18.5
Chelsea	37	—11	11.5	1.20	17.0
Chittenden	.....	.....	.....	1.04	.....
Cornwall	38	—14	13.8	1.00	10.5
Enosburg Falls	37	—24	9.1	0.54	5.2
Jacksonville	40	—21	9.8	3.31	43.7
Manchester	35	—14	13.9	1.05	20.0
Norwich	37	—15	11.4	1.70	17.0
St. Johnsbury	37	—22	11.5	1.08	12.6
Wells	32	—12	11.7	1.57	18.5
Westfield	.....	.....	.....	1.77	.....
Woodstock	38	—22	11.2	1.30	21.0
Virginia.					
Ashland	48	— 6	27.8	2.40	8.5
Barboursville	49	3	28.7	2.95	8.5
Bedford	63	0	30.8	.....	5.0
Bigstone Gap	57	—15	30.2	4.24	6.5
Blacksburg	59	— 4	27.6	6.07	11.0
Buchanan	.....	.....	.....	3.60	8.2
Burkes Garden	44	—12	23.0	1.76	7.0
Callaville	54	6	30.0	4.35	2.0
Cape Henry	57	13	32.0	3.86	1.7
Charlottesville	50	3	28.2	2.86	8.0
Clarksville	.....	.....	.....	4.84	3.0
Columbia	50	3	29.2	3.50	10.5
Dale Enterprise	47	— 5	24.7	2.12	11.5
Danville	.....	.....	.....	3.69	3.5
Dinwiddie	54	1	30.4	4.80	3.0
Elk Knob	53	—10	29.8	4.60	6.0
Farmville	50	6	29.9	1.70	3.5
Fredericksburg	49	— 8	26.2	2.95	5.2
Grahams Forge	48	— 2	27.9	2.75	10.5
Hampton	54	11	32.6	4.37	3.5
Hot Springs	48	— 6	24.4	3.20	11.0
Howardsville	.....	.....	.....	3.28	5.0
Ivanhoe	.....	.....	.....	3.61	.....
Lexington	48	— 3	26.4	2.88	11.5
Lincoln	45	— 4	24.5	2.13	3.0
Mendota	.....	.....	.....	4.27	4.3
Newport News	54	9	32.2	4.48	4.5
Petersburg	56	7	31.8	2.91	5.0
Quantico	48	— 2	28.0	.....	.....
Radford	.....	.....	.....	1.00	8.0
Randolph	.....	.....	.....	3.89	3.0
Riverton	.....	.....	.....	1.90	6.0
Roanoke	51	— 2	33.2[d]	3.53	10.0
Saxe	54	5	31.0	3.52	1.5
Speers Ferry	.....	.....	.....	4.48	6.0
Spottsville	52	4	30.4	4.29	4.1
Staunton	50	1	28.2	2.64	11.0
Stephens City	51	— 4	25.2	.....	.....
Warsaw	57	— 1	27.5	1.95	5.5
Wilkerson	48	0	28.2	3.28	.....
Williamsburg	56	5	30.8	4.50	3.0
Woodstock	48	— 4	25.0	1.77	9.9
Washington.					
Aberdeen	73	17	43.6	6.01	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Anacortes	59	17	41.6	1.52	
Ashford	.....	.....	.....	2.42	4.0
Bellingham	63	13	42.0	2.00	
Bremerton	63	18	41.2	4.91	
Blaine	58	14	38.6	3.25	
Brinnon	71	17	41.2	6.89	
Cedonia	52	—10	25.6	0.97	2.5
Centralia	71	14	42.0	2.69	
Cheney	64	— 5	30.0	0.79	3.0
Clearbrook	61	14	38.0	3.28	
Clearwater	63	21	39.9	10.30	
Cle Elum	63	—13	27.6	1.41	2.0
Colville	56	—15	25.3	0.55	1.5
Conconully	58	—11	24.6	0.77	0.6
Coupeville	62	18	42.0	0.95	
Crescent	55	—13	27.4	1.45	4.0
Cusick	58	—22	24.2	1.25	1.0
Danville	53	—12	23.7	0.38	1.7
Dayton	65	—12	33.2	0.82	4.5
East Sound	60	12	39.8	2.09	
Ellensburg	60	— 7	29.3	0.36	
Ephrata	59	— 1	31.8	0.42	T.
Grandmound	65	11	39.2	3.02	
Granite Falls	.....	.....	.....	4.78	
Hatton	76[c]	— 4[c]	36.8[c]	0.19	
Horseheaven	.....	.....	.....	0.05	
Ilwaco	71	19	44.6	6.78	
Kennewick	72	— 3	35.2	0.11	T.
Kiona	70	— 1	35.0	0.12	T.
Lacenter	68	13	40.0	2.82	0.2
Lakeside	52	0	28.8	0.27	0.6
Lester	64	8	37.2	2.95	8.0
Lind	63	— 3	32.3	0.43	1.0
Loomis	52	— 1	27.0	0.40	1.0
Mottinger Ranch	71	1	34.8	0.39	T.
Mount Pleasant	69	12	39.7	2.16	T.
Moxee	70	— 2	31.0	0.28	T.
Northport	53	—17	23.5	0.28	2.8
Odessa	62	0	31.9	0.27	
Olga	58	20	41.1	1.69	
Olympia	65	11	40.6	4.17	
Pinehill	66	— 4	34.9	0.97	4.5
Pomeroy	64	15	32.6	0.60	4.0
Port Townsend	58	23	41.6	0.52	T.
Pullman	62	— 9	31.2	0.48	0.5
Rattlesnake	57	— 7	29.8	0.42	1.0
Republic	55	—18	23.3	0.85	1.0
Ritzville	.....	.....	.....	0.57	
Rosalia	60	— 9	30.7	0.49	1.6
Sedro	68	16	40.8	1.92	
Snohomish	68	16	41.2	3.40	1.0
Snoqualmie	65	18	40.5	3.83	
Southbend	71	20	47.0	.....	.....
South Ellensburg	56	— 8	28.1	.....	.....
Sprague	.....	.....	.....	0.50	
Sunnyside	63	1	33.4	0.30	
Trinidad	57	3	31.2	0.27	0.2
Twisp	50	—18	22.0	0.74	7.0
Union	69	16	40.9	6.34	
Vancouver	71	11	41.6	1.95	0.3
Vashon	61	18	42.1	2.69	T.
Wahluke	62	1	35.0	0.21	
Waterville	50	—17	24.4	0.57	4.0
Wenatchee (near)	63	— 5	29.5	0.69	3.5
Wilbur	58	— 6	28.4	0.77	1.8
Zindel	67	0	36.6	0.63	
West Virginia.					
Bancroft	50	—10	27.6	3.08	11.0
Bayard	48	—18	21.2	3.02	26.4
Bens Run	.....	2	26.2	2.21	6.0
Bluefield	54	— 7	26.7	2.42	.....
Buckhannon	49	—19	24.9	2.60	8.0
Burlington	48	— 7	24.6	0.90	9.0
Cairo	48	—16	26.6	.....	.....
Central	44	—16	24.1	2.20	5.5
Charleston	51	— 2	31.2	2.99	7.5
Creston	46	—13	25.6	1.79	.....
Cuba	46	—15	25.0	2.07	3.4
Elkhorn	50	— 7	28.8	3.31	4.9
Fairmont	.....	.....	.....	1.76	2.4
Glenville	47	—14	26.4	3.77	6.0
Grafton	48	—17	25.1	1.44	8.2
Green Sulphur Springs	54	— 9	25.3	3.04	16.3
Harpers Ferry	.....	.....	.....	2.18	12.6
Hinton	.....	.....	.....	3.97	13.7
Huntington	46	— 5	25.2	2.35	3.5
Leonard	48	—11	21.6	.....	.....
Lewisburg	49	— 6	25.8	1.24	9.7
Logan	54	— 5	33.0	4.65	8.0
Lost Creek	45	—17	24.6	2.27	.....
Mannington	46	—15	24.8	1.50	4.8
Martinsburg	45	0	22.8	0.85	7.0
Moorefield	53	— 8	25.2	0.80	7.0
Morgantown	54	— 8	24.8	1.75	.....
Moundsville	45	—12	25.7	.....	.....
New Cumberland	47	—11	22.4	2.87	5.0
New Martinsville	46	— 9	26.4	1.94	3.5
Parsons	54	—21	24.8	3.10	.....

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Philippi	48	—22	25.0	2.48	7.6
Pickens	43	—13	21.5	3.66	17.0
Point Pleasant	53	— 5	28.4	2.38	4.0
Princeton	49	— 4	27.9	2.95	14.5
Rowlesburg	.....	.....	.....	2.99	9.5
Ryan	47	—15	26.2	2.32	8.2
Smithfield	49	—15	24.9	1.50	4.8
Southside	48	—13	27.2	2.57	7.0
Terra Alta	48	—15	21.0	2.59	16.5
Uppertract	47	— 4	25.9	1.63	.....
Valley Fork	47	—13	28.4	1.37	6.5
Wellsburg	45	— 9	21.8	1.76	5.6
Weston	47	—12	25.7	3.19	11.5
Wheeling[b]	49	— 4	28.4	1.65	2.5
Williamson	56	— 8	27.7	3.73	8.0
Wisconsin.					
Amherst	39	—25	9.9	1.70	17.0
Antigo	39	—26	10.5	0.65	6.5
Appleton	38	—24	13.0	0.93	9.7
Appleton Marsh	43	—28	9.0	1.70	16.1
Ashland	.....	.....	.....	0.45	4.5
Barron	48	—30	8.8	0.50	5.0
Beloit	40	—24	13.2	1.37	12.3
Berlin	43[c]	—25	8.1[b]	1.25	12.5
Black River Falls	.....	.....	.....	0.90	12.0
Brodhead	45	—31	12.3	1.90	18.0
Burnett	39	—26	9.5	1.11	16.5
Butternut	42	—35	9.2	0.44	4.4
Chilton	38	—24	11.8	1.89	18.0
Citypoint	.....	.....	.....	0.69	7.0
Darlington	38[c]	—29[c]	9.5[c]	2.15	21.0
Downing	50	—34	8.9	1.00	10.0
Eau Claire	46	—29	10.0	0.49	3.7
Florence	45	—24	10.3	0.85	8.5
Fond du Lac	40	—27	11.5	1.36	15.0
Grand Rapids	40	—30	9.9	0.95	10.5
Grand River Locks	.....	.....	.....	0.85	17.5
Grantsburg	51	—36	10.2	0.55	5.5
Hancock	38	—28	8.8	1.20	12.0
Harvey	42	—23	11.8	1.46	14.4
Hayward	46	—38	7.1	0.37	3.7
Hillsboro	51	—35	8.6	1.70	16.0
Koepenick	44	—25	9.2	0.80	8.0
Lancaster	48	—30	11.6	2.19	22.0
Manitowoc	39	—22	15.0	1.23	18.7
Mauston	47	—29	11.0	1.74	10.5
Meadow Valley	41	—29	7.6	0.85	16.2
Medford	47	—28	11.2	0.70	7.0
Menasha	.....	.....	.....	0.93	9.0
Minocqua	47	—28	8.1	0.51	6.0
Mount Horeb	42	—30	11.2	2.02	15.1
Neillsville	42	—34	8.0	1.95	18.2
New London	41	—26	11.6	1.37	12.0
New Richmond	48	—30	10.6	0.30	3.0
Oconto	42	—22	12.2	1.30	13.0
Osceola	50	—38	9.3	0.78	11.0
Oshkosh	39	—26	11.8	1.10	9.0
Pine River	40	—27	11.3	0.97	13.7
Portage	41	—25	12.0	0.84	14.0
Port Washington	38	—25	11.7	2.40	25.0
Prairie du Chien[a]	50	—28	14.5	1.14	10.0
Prentice	47	—36	8.9	0.52	8.5
Racine	39	—21	15.8	0.85	6.1
Sheboygan	39	—19	16.0	3.20	32.0
Spooner	49	—35	7.6	0.35	4.4
Stanley	42	—31	9.6	0.93	9.3
Stevens Point	45	—28	10.3	0.50	5.0
Valley Junction	45	—28	11.0	0.92	9.0
Viroqua	48	—27	11.6	1.43	13.5
Watertown	40	—29	9.6	1.84	19.0
Waukesha	40	—22	12.8	1.21	12.5
Waupaca	38	—25	10.3	0.96	17.0
Wausau	40	—25	10.0	0.68	6.4
Whitehall	46	—38	8.8	1.10	11.0
Wyoming.					
Afton	46	—41	13.4	1.28	17.0
Alcova	53	—35	19.0	0.27	3.0
Basin	67	—34	18.4	T.	T.
Bedford	47	—46	14.1	0.95	9.5
Border	45	—48	10.2	0.30	.....
Buffalo	65	—35	16.6	0.05	0.5
Cambria	61	—27	22.5	0.75	7.5
Chugwater	60	—33	19.4	0.60	6.0
Daniel	44	—51	8.0	0.58	5.8
Eatons Ranch	70	—26	25.6	0.70	7.0
Embar	60	—32	19.4	0.10	1.0
Evanston	48	—38	21.5	0.45	4.0
Fontenelle	50	—41	14.0	0.10	1.0
Fort Laramie	65	—32	16.6	0.81	12.5
Fort Washakie	62	—32	19.4	0.32	3.2
Gillette	61	—28	19.1	0.20	2.0
Granite Canyon	57	—31	20.3	0.70	7.0
Green River	53	—31	18.3	2.14	.....
Griggs	66	—51	18.2	0.33	3.3
Hatton	.....	.....	.....	0.50	5.0
Hyattville	60	—31	19.9	0.40	4.0
Iron Mountain	54	—29	17.2	0.83	4.2
Kirtley	58	—27	15.4	0.20	0.8

TABLE II.—*Climatological record of cooperative observers. Late reports for January*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
Laramie	52	—42	15.6	0.42	4.2
Leo	46	—42	15.2	0.45	6.2
Little Medicine	46	—39	11.6	0.50	5.0
Lolabama Ranch	54	—41	17.6	0.08	.....
Lusk	60	—35	19.2	0.77	7.7
Marquette	62	—33	22.0	0.35	3.5
Meeteetse	61	—27	19.2	0.38	3.8
Moore	48	—27	19.1	0.58	11.8
Moorcroft	60	—40	14.1	0.90	9.0
Phillips	61	—33	20.2	0.70	7.0
Pine Bluff	63	—33	18.0	1.00	10.0
Rock Springs	52	—42	18.3	0.60	6.0
Sheridan	65	—36	18.6	0.20	2.0
South Pass City	49	—40	13.6	0.60	6.0
Thayne	46	—47	13.5	0.98	10.1
Thermopolis	65	—36	15.4	0.25	2.5
Torrington	58	—32	15.4	0.34	6.0
Wells	42	—42	10.5	0.48	5.0
Wilson	.....	.....	.....	0.40	4.0
Yellowstone Park (C. H.)	50	—53	11.4	0.25	5.0
Yellowstone Pk. (Foun'n)	53	.....	.....	1.40	.....
Yellowstone Pk. (Lake)	48	—51	9.7	0.50	.....
Yellowttone Pk. (Norris)	50	—51	15.1	0.55	7.0
Yellowstone Pk. (U. Ba'n)	50	—45	21.2	0.66	.....
Yellowstone Pk. (Soda B.)	48	—53	9.0	0.35	3.5
Porto Rico.					
Adjuntas	85	49	67.4	1.82	
Aguirre	94	62	77.4	0.74	
Albonito	78	46	66.4	2.69	
Barros	87	54	68.1	.....	
Bayamon	85	54	72.0	2.31	
Caguas	90	52	71.6	2.38	
Canovanas	87	64	75.5	2.03	
Cidra	89	55	72.2	0.62	
Coamo	89	58	74.7	2.83	
Corozal	90	55	76.2	2.11	
Fajardo	88	60	75.8	2.12	
Guanica	92	60	76.3	0.80	
Hacienda Colo-a	91	57	73.8	2.34	
Hacienda Josefa	.....	.....	.....	0.49	
Humacao	84	66	76.2	2.16	
Ingenio	.....	.....	.....	2.28	
Juana Diaz	91	64	78.5	T.	
La Carmelita	85	59	71.1	3.45	
La Ysolina	86	59	72.5	3.45	
Lares	87	55	71.0	0.98	
Las Marias*	87	54	71.4	.....	
Manati	90	58	74.4	1.82	
Maunabo	89	59	75.7	1.70	
Mayaguez	91	55	73.7	1.83	
Morovis	90	55	72.8	2.90	
Ponce	87	61	75.0	0.01	
Rio Blanco	86	60	74.0	4.35	
Rio Piedras	.....	.....	.....	2.53	
San German	88	56	73.2	2.69	
San Lorenzo	86	53	71.6	2.95	
San Salvador	82	54	69.6	2.11	
Santa Isabel	88	60	74.2	0.36	
Vieques	88	67	76.8	1.04	
Yauco	84	60	72.9	0.64	
New Brunswick.					
St. John	35	—4	15.0	3.35	29.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Haiti.	°	°	°	*Ins.*	*Ins.*
Port au Prince	93	64	78.6	2.51	

Late reports for January, 1905.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.	°	°	°	*Ins.*	*Ins.*
Chestochena	45	—33	—3.8	0.05	0.5
Copper Center	39	—44	—8.0	0.29	4.0
Fairbanks	20	—48	—17.0	0.92	9.2
Fort Gibbon	32	—44	—2.2	0.37	3.0
Karluk	37	— 2	25.8	1.80	5.0
Ketchemstock	10	—52	—17.6	0.09	1.5
Wood Island	53	20	33.4	4.80	4.0
Arkansas.					
Conway	66	3	34.4	4.35	6.5
Ozark	67	1	32.2	3.97	5.3
California.					
Angiola	71	31	49.6	1.28	
Imperial	84	30	57.4	1.50	
Kernville	.....	.....	.....	1.00	
Laytonville	.....	.....	.....	9.27	
Upland	.....	.....	.....	4.30	
Georgia.					
Abbeville	.....	.....	.....	3.20	
Bowersville	67	10	38.6	2.38	0.2
Canton	.....	.....	.....	5.53	T.
Carlton	.....	.....	.....	2.03	
Cordele	71	12	41.0	3.74	
Dahlonega	68	2	35.6	5.77	4.5
Diamond	63	1	33.2	7.91	5.8
Dublin	.....	.....	.....	2.97	
Glennville	70	15	44.4	2.26	
Hawkinsville	74	14	41.4	2.81	
Milledgeville	65	14	40.9	1.93	
Montezuma	.....	.....	.....	2.52	
Point Peter	67	11	38.5	2.44	T.
Resaca	.....	.....	.....	4.66	T.
Vidalia	72	15	44.8	4.05	
Waverly	78	15	47.3	1.17	
Illinois.					
Grafton	.....	.....	.....	1.40	11.0
Mount Carmel	.....	.....	.....	3.28	18.8
Iowa.					
Osceola	56	—17	12.2	.....	.....
Montana.					
Hamilton	52	— 8	25.2	0.17	3.0
Nebraska.					
Callaway	65	—25	19.9	1.35	11.0
Grand Island	53	—19	14.2	.....	.....
Kimball	.....	.....	.....	0.65	6.5
Tecumseh	.....	.....	.....	0.88	.....
South Carolina.					
St. Stephens	.....	.....	.....	1.02	.....
Washington.					
Bremerton	50	27	39.2	10.33	8.0
Wisconsin.					
Grand River Locks	.....	.....	.....	0.62	22.5
Wyoming.					
Thayne	47	—20	21.5	1.51	14.4

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. + 4.
[2] Mean of 8 a. m. + 8 p. m. + 2.
[3] Mean of 7 a. m. + 7 p. m. + 2.
[4] Mean of 6 a. m. + 6 p. m. + 2.
[5] Mean of 7 a. m. + 2 p. m. + 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "*a*" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

December, 1904, Florida, Inverness, make mean temperature 56.1 instead of 56.3; Johnstown, make mean temperature 54.4[4] instead of 54.7[4]. Illinois, Sullivan, make total precipitation 1.26 instead of 1.06. Pennsylvania, Bellefonte, make total precipitation 2.22 instead of 1.52. South Dakota, Leslie, make total precipitation ..... instead of 0.00.

January, 1905, Iowa, Marshalltown, make total snowfall 12.1 instead of 11.1. Iowa, Storm Lake, make total precipitation and snowfall 1.48 and 14.8 instead of 0.12 and 1.5. Nebraska, Burge, make total snowfall 15.0 instead of 14.8. New York, Lowville, make total snowfall 44.7 instead of 43.8. Virginia, Farmville, make total precipitation and snowfall 2.44 and 1.5 instead of 2.66 and 4.5. Wyoming, Border, make mean temperature 18.0 instead of 17.8.

NOTE.—The following change has been made in names of stations: New York, Primrose, changed to Mount Hope.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of February, 1905.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	18	6	8	34	n. 65 w.	29
Portland, Me	22	15	0	36	n. 79 w.	37
Concord, N. H.†	12	3	8	11	n. 18 w.	10
Northfield, Vt	23	24	5	13	s. 83 w.	8
Boston, Mass	15	11	4	35	n. 83 w.	31
Nantucket, Mass	20	6	8	32	n. 60 w.	28
Block Island, R. I	21	9	8	32	n. 63 w.	27
Providence, R. I	17	3	5	41	n. 69 w.	39
Hartford, Conn	28	13	0	28	n. 62 w.	32
New Haven, Conn	24	9	7	29	n. 56 w.	27
Middle Atlantic States.						
Albany, N. Y	28	15	9	15	n. 25 w.	14
Binghamton, N. Y.†	9	3	8	14	n. 45 w.	8
New York, N. Y	26	6	8	27	n. 44 w.	28
Harrisburg, Pa	17	9	11	28	n. 65 w.	19
Philadelphia, Pa	29	8	8	29	n. 45 w.	30
Scranton, Pa	22	16	12	22	n. 59 w.	12
Atlantic City, N. J	27	6	5	29	n. 49 w.	32
Cape May, N. J	27	9	6	26	n. 48 w.	27
Baltimore, Md	27	8	7	27	n. 46 w.	28
Washington, D. C	29	11	7	24	n. 43 w.	25
Lynchburg, Va	21	11	11	26	n. 56 w.	18
Mount Weather, Va	25	13	9	26	n. 55 w.	21
Norfolk, Va	31	10	15	14	n. 3 e.	21
Richmond, Va	27	12	9	19	n. 34 w.	18
Wytheville, Va	11	7	11	35	n. 81 w.	24
South Atlantic States.						
Asheville, N. C	24	16	13	18	n. 32 w.	9
Charlotte, N. C	26	10	23	13	n. 32 e.	19
Hatteras, N. C	36	7	19	11	n. 15 e.	30
Raleigh, N. C	32	8	9	21	n. 27 w.	27
Wilmington, N. C	32	8	12	18	n. 14 w.	25
Charleston, S. C	26	7	17	20	n. 9 w.	19
Columbia, S. C	24	7	22	19	n. 10 e.	17
Augusta, Ga	25	5	18	24	n. 17 w.	21
Savannah, Ga	30	6	16	17	n. 2 w.	24
Jacksonville, Fla	28	11	20	16	n. 13 e.	18
Florida Peninsula.						
Jupiter, Fla	24	17	14	16	n. 16 w.	7
Key West, Fla	22	12	26	5	n. 65 e.	23
Tampa, Fla	26	11	21	14	n. 25 e.	17
Eastern Gulf States.						
Atlanta, Ga	20	8	19	23	n. 18 w.	13
Macon, Ga.†	18	1	8	7	n. 3 e.	17
Pensacola, Fla.†	17	2	9	7	n. 8 e.	15
Birmingham, Ala.†	16	2	8	7	n. 4 e.	14
Mobile, Ala	33	13	8	10	n. 6 w.	20
Montgomery, Ala	32	6	12	19	n. 15 w.	27
Meridian, Miss.†	16	1	9	6	n. 11 e.	15
Vicksburg, Miss	29	10	19	12	n. 20 e.	20
New Orleans, La	35	7	17	11	n. 12 e.	29
Western Gulf States.						
Shreveport, La	29	10	15	16	n. 3 w.	19
Fort Smith, Ark	17	7	24	19	n. 27 e.	11
Little Rock, Ark	28	8	13	20	n. 19 w.	21
Corpus Christi, Tex	36	6	18	7	n. 20 e.	32
Fort Worth, Tex	32	12	8	17	n. 24 w.	22
Galveston, Tex	29	10	23	6	n. 42 e.	26
Palestine, Tex	34	8	14	10	n. 9 e.	26
San Antonio, Tex	31	8	22	4	n. 38 e.	29
Taylor, Tex.†	21	3	2	5	n. 9 w.	18
Ohio Valley and Tennessee.						
Chattanooga, Tenn	24	13	12	22	n. 42 w.	15
Knoxville, Tenn	27	11	12	20	n. 27 w.	18
Memphis, Tenn	27	12	13	17	n. 15 w.	16
Nashville, Tenn	24	11	16	20	n. 17 w.	14
Lexington, Ky.†	6	6	10	12	w.	2
Louisville, Ky	18	14	14	21	n. 60 w.	8
Evansville, Ind.†	9	4	9	10	n. 11 w.	5
Indianapolis, Ind	19	19	12	25	w.	13
Cincinnati, Ohio	15	11	18	25	n. 60 w.	8
Columbus, Ohio	10	19	12	27	s. 59 w.	18
Pittsburg, Pa	19	11	9	32	n. 71 w.	24
Parkersburg, W. Va	16	15	13	26	n. 86 w.	13
Elkins, W. Va	17	12	1	34	n. 81 w.	33
Lower Lake Region.						
Buffalo, N. Y	6	19	7	36	s. 66 w.	32
Oswego, N. Y	14	22	14	22	s. 45 w.	11
Rochester, N. Y	5	23	6	34	s. 57 w.	33
Syracuse, N. Y	10	16	8	31	s. 75 w.	24
Erie, Pa	7	15	8	34	s. 73 w.	27
Cleveland, Ohio	7	24	8	26	s. 47 w.	25
Sandusky, Ohio†	5	7	4	18	s. 82 w.	14
Toledo, Ohio	9	18	11	31	s. 66 w.	22
Detroit, Mich	13	16	8	31	s. 83 w.	23
Upper Lake Region.						
Alpena, Mich	13	10	6	33	n. 84 w.	27
Escanaba, Mich	20	16	8	26	n. 77 w.	18
Grand Rapids, Mich	14	20	14	20	s. 45 w.	8
Houghton, Mich.†	13	3	5	12	n. 35 w.	12
Marquette, Mich	15	14	9	28	n. 87 w.	19
Port Huron, Mich	11	20	9	31	s. 68 w.	24
Sault Ste. Marie, Mich	17	10	14	27	n. 62 w.	15
Chicago, Ill	14	15	10	29	s. 87 w.	19
Milwaukee, Wis	14	14	8	32	w.	24
Green Bay, Wis	11	20	8	27	s. 65 w.	21
Duluth, Minn	23	8	12	28	n. 47 w.	22

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
North Dakota.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Moorhead, Minn	24	18	8	20	n. 63 w.	13
Bismarck, N. Dak	18	4	20	26	n. 23 w.	15
Devils Lake, N. Dak	12	16	14	29	s. 75 w.	16
Williston, N. Dak	9	24	8	23	s. 45 w.	21
Upper Mississippi Valley.						
Minneapolis, Minn.*	10	7	2	11	n. 72 w.	10
St. Paul, Minn	25	17	8	23	n. 62 w.	17
La Crosse, Wis.†	8	13	2	6	s. 39 w.	6
Madison, Wis	16	17	7	27	s. 87 w.	20
Charles City, Iowa	19	13	11	24	n. 65 w.	14
Davenport, Iowa	18	10	10	28	n. 66 w.	20
Des Moines, Iowa	18	12	11	28	n. 71 w.	18
Dubuque, Iowa	23	9	6	32	n. 62 w.	30
Keokuk, Iowa	19	17	9	25	n. 83 w.	16
Cairo, Ill	26	14	13	19	n. 27 w.	13
La Salle, Ill.†	8	5	4	17	n. 77 w.	13
Peoria, Ill	11	8	5	8	n. 45 w.	4
Springfield, Ill	16	19	11	25	s. 78 w.	14
Hannibal, Mo.†	6	8	5	14	s. 77 w.	9
St. Louis, Mo	18	15	17	19	n. 34 w.	4
Missouri Valley.						
Columbia, Mo.*	8	10	5	9	s. 63 w.	4
Kansas City, Mo	19	19	12	23	w.	11
Springfield, Mo	20	15	13	22	n. 61 w.	10
Topeka, Kans.*	9	8	4	10	n. 80 w.	6
Lincoln, Nebr	21	20	5	18	n. 86 w.	13
Omaha, Nebr	25	19	6	19	n. 65 w.	14
Valentine, Nebr	20	11	4	33	n. 73 w.	30
Sioux City, Iowa †	14	6	8	11	n. 21 w.	8
Pierre, S. Dak	17	13	16	25	n. 66 w.	10
Huron, S. Dak	22	17	14	21	n. 54 w.	9
Yankton, S. Dak. †	8	6	5	15	n. 79 w.	10
Northern Slope.						
Havre, Mont	14	15	10	34	s. 88 w.	24
Miles City, Mont	25	17	1	19	n. 66 w.	20
Helena, Mont	14	20	3	36	s. 80 w.	34
Kalispell, Mont	5	12	0	43	s. 81 w.	44
Rapid City, S. Dak	19	9	11	28	n. 60 w.	20
Cheyenne, Wyo	24	14	5	26	n. 65 w.	23
Lander, Wyo	19	15	28	7	n. 79 e.	21
Yellowstone Park, Wyo	11	32	5	20	s. 35 w.	26
North Platte, Nebr	13	10	9	35	n. 83 w.	26
Middle Slope.						
Denver, Colo	23	23	13	10	e.	3
Pueblo, Colo	21	13	22	14	n. 45 e.	11
Concordia, Kans	20	22	11	15	s. 63 w.	4
Dodge, Kans	21	14	10	20	n. 55 w.	12
Wichita, Kans	24	20	11	11	n.	4
Oklahoma, Okla	25	15	12	16	n. 22 w.	11
Southern Slope.						
Abilene, Tex	33	14	10	8	n. 6 e.	19
Amarillo, Tex	21	20	12	15	n. 72 w.	3
Roswell, N. Mex.	16	28	13	8	s. 23 e.	13
Southern Plateau.						
El Paso, Tex	18	7	26	18	n. 36 e.	14
Santa Fe, N. Mex	20	17	18	18	n.	3
Flagstaff, Ariz	17	14	15	20	n. 59 w.	6
Phoenix, Ariz	9	15	29	14	s. 68 e.	16
Yuma, Ariz	29	13	16	11	n. 17 e.	17
Independence, Cal	25	20	15	13	n. 22 e.	5
Middle Plateau.						
Carson City, Nev	14	18	19	16	s. 37 e.	5
Winnemucca, Nev	27	13	22	14	n. 30 e.	16
Modena, Utah	12	1	26	21	n. 24 e.	12
Salt Lake City, Utah	16	18	18	21	s. 56 w.	4
Durango, Colo	25	18	6	17	n. 58 w.	13
Grand Junction, Colo	18	14	26	11	n. 75 e.	16
Northern Plateau.						
Baker City, Oreg	13	27	24	15	s. 32 e.	17
Boise, Idaho	9	26	16	21	s. 16 w.	18
Lewiston, Idaho†	5	4	19	5	n. 86 e.	14
Pocatello, Idaho	5	16	26	17	s. 39 e.	14
Spokane, Wash	17	12	30	12	n. 74 e.	19
Walla Walla, Wash	5	35	11	12	s. 2 w.	30
North Pacific Coast Region.						
North Head, Wash	10	13	30	11	s. 81 e.	19
Port Crescent, Wash.*	4	6	18	4	s. 82 e.	14
Seattle, Wash	21	10	25	11	n. 52 e.	18
Tacoma, Wash	25	15	11	15	n. 22 w.	11
Tatoosh Island, Wash	5	10	36	8	s. 80 e.	28
Portland, Oreg	9	15	31	14	s. 71 e.	18
Roseburg, Oreg	21	14	10	23	n. 62 w.	15
Middle Pacific Coast Region.						
Eureka, Cal	18	21	16	14	s. 34 e.	4
Mount Tamalpais, Cal	26	12	17	18	n. 4 w.	14
Red Bluff, Cal	36	12	12	7	n. 12 e.	24
Sacramento, Cal	22	15	22	11	n. 58 e.	13
San Francisco, Cal	16	10	16	23	n. 49 w.	9
South Pacific Coast Region.						
Fresno, Cal	16	16	16	22	w.	6
Los Angeles, Cal	15	3	24	18	n. 41 e.	9
San Diego, Cal	18	15	21	15	n. 63 e.	7
San Luis Obispo, Cal	26	13	11	18	n. 28 w.	15
West Indies						
Havana, Cuba†	5	2	21	1	n. 81 e.	20
San Juan, Porto Rico	1	19	42	1	s. 66 e.	45
Hamilton, Bermuda	18	19	10	24	s. 86 w.	14

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during February, 1905, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total amount of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.												
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	5-6			0.54														*			
Alpena, Mich.	5-6			0.56														*			
Amarillo, Tex.	17-18			0.80														*			
Asheville, N. C.	19-20			1.23														*			
Atlanta, Ga.	19-20			0.72														0.36			
Atlantic City, N. J.	5-6			1.05														0.39			
Augusta, Ga.	11-13			3.44														0.54			
Baltimore, Md.	12			0.50														0.17			
Binghamton, N. Y.	5-6			0.29														*			
Birmingham, Ala.	7-8			2.94														0.43			
Bismarck, N. Dak.	26			0.48														*			
Block Island, R. I.	12-13			0.44														*			
Boise, Idaho.	2			0.32														*			
Boston, Mass.	12-13			0.46														0.12			
Buffalo, N. Y.	12-13			0.59														*			
Cairo, Ill.	11-12			0.62														0.15			
Charleston, S. C.	8-9			0.58														0.37			
Charlotte, N. C.	19-20			1.92														0.24			
Chattanooga, Tenn.	7 8			2.49														*			
Chicago, Ill.	24-25			0.60														*			
Cincinnati, Ohio.	8-9			0.59														*			
Cleveland, Ohio.	5-6			0.41														*			
Columbia, Mo.	4-5			0.64														*			
Columbia, S. C.	20-21			1.41														0.23			
Columbus, Ohio.	12			0.55														*			
Concord, N. H.	12-13			0.80														*			
Corpus Christi, Tex.	18-19			1.86														0.27			
Davenport, Iowa.	4-5			0.54														*			
Denver, Colo.	10-12			0.19														*			
Des Moines, Iowa.	4-5			0.44														*			
Detroit, Mich.	12			0.49														*			
Dodge, Kans.	10-12			0.35														*			
Dubuque, Iowa.	8			0.50														*			
Duluth, Minn.	8-9			0.32														*			
Eastport, Me.	24-25			0.65														*			
Elkins, W. Va.	8-9			0.76														0.14			
Erie, Pa.	12-13			0.34														*			
Escanaba, Mich.	8			0.58														*			
Evansville, Ind.	8			0.88														*			
Fort Smith, Ark.	18-19			0.86														*			
Fort Worth, Tex.	17-18			1.18														*			
Galveston, Tex.	11	3:45 a. m.	8:10 a. m.	1.05	6:25 a. m.	6:55 a. m.	0.47	0.06	0.14	0.34	0.39	0.44	0.52	0.56							
Grand Junction, Colo.	4			0.19														0.06			
Grand Rapids, Mich.	8-10			0.34														*			
Green Bay, Wis.	8			0.50														*			
Hannibal, Mo.	4-5			0.69														*			
Harrisburg, Pa.	12			0.30														*			
Hatteras, N. C.	20-21			1.67														*			
Huron, S. Dak.	26			0.14														*			
Indianapolis, Ind.	12			0.61														*			
Jacksonville, Fla.	13	10:20 a. m.	6:15 p. m.	1.02	10:49 a. m.	11:14 a. m.	0.07	0.18	0.25	0.47	0.60	0.68									
Jupiter, Fla.	21			0.95														0.39			
Kalispell, Mont.	9-10			0.63														*			
Kansas City, Mo.	23-24			0.41														0.16			
Key West, Fla.	1			0.15										0.13							
Knoxville, Tenn.	8			1.81														0.23			
La Crosse, Wis.	8			0.40														*			
Lewiston, Idaho.	20-21			0.19														0.09			
Lexington, Ky.	8-9			0.95														*			
Lincoln, Nebr.	10-11			0.26														*			
Little Rock, Ark.	2-3			0.57														*			
Los Angeles, Cal.	1-2			1.30														0.46			
Louisville, Ky.	8			1.12														0.18			
Lynchburg, Va.	12-13			0.90														0.15			
Macon, Ga.	11-13			4.65														0.65			
Memphis, Tenn.	7-8			0.76														*			
Meridian, Miss.	7-8			5.44														0.62			
Milwaukee, Wis.	5-6			1.02														*			
Minneapolis, Minn.	8-9			0.39														*			
Montgomery, Ala.	12-13			2.75														0.27			
Nantucket, Mass.	6			0.72														0.16			
Nashville, Tenn.	5			0.59														0.14			
New Haven, Conn.	12-13			0.80														0.16			
New Orleans, La.	11			2.58														0.37			
New York, N. Y.	5-6			1.21														0.26			
Norfolk, Va.	20-21			1.02														0.18			
Northfield, Vt.	6-7			0.30														*			
North Head, Wash.	19-21			1.69														0.37			
Oklahoma, Okla.	18			0.41														*			
Omaha, Nebr.	10-11			0.38														0.05			
Palestine, Tex.	18-19			0.86														0.08			
Parkersburg, W. Va.	25			0.26														0.11			
Pensacola, Fla.	20			0.81														0.52			
Philadelphia, Pa.	12			0.77														0.25			
Pittsburg, Pa.	8-9			0.37														*			
Pocatello, Idaho.	20			0.36														*			
Portland, Me.	12-13			0.94														*			
Portland, Oreg.	18			0.45														0.17			
Pueblo, Colo.	7			0.37														*			
Raleigh, N. C.	20			2.84														*			
Richmond, Va.	5-6			0.92														*			
Rochester, N. Y.	8-9			0.41														*			
Sacramento, Cal.	1-2			1.33														0.25			
St. Louis, Mo.	8			0.42														0.11			
St. Paul, Minn.	8-9			0.20														0.05			
Salt Lake City, Utah.	2			0.67														*			
San Antonio, Tex.	17-18			1.21														0.19			
San Diego, Cal.	2-3			1.49														0.45			
Sandusky, Ohio.	12-13			0.70														*			
San Francisco, Cal.	4-5			0.53														0.23			
Savannah, Ga.	5-6			0.98														0.60			

TABLE IV.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Scranton, Pa	5–6			0.44														*			
Seattle, Wash	22			0.40														0.12			
Shreveport, La	18–19			2.14														0.23			
Spokane, Wash	19			0.21														*			
Springfield, Ill	5			0.42														*			
Springfield, Mo	4–5			0.42														*			
Syracuse, N. Y	5–6			0.58														*			
Tampa, Fla	6			0.44														0.41			
Taylor, Tex	18–19			1.01														0.16			
Toledo, Ohio	12			0.49														*			
Topeka, Kans	2–3			0.61														*			
Vicksburg, Miss	19			1.79														0.35			
Washington, D. C	12			0.55														0.16			
Wichita, Kans	2–3			0.18														*			
Williston, N. Dak	8			0.03														*			
Wilmington, N. C	5–6			1.23														0.51			
Wytheville, Va	8			1.27														*			
Yankton, S. Dak	9–8			0.22														*			
Havana, Cuba	2			0.26									0.26								
San Juan, Porto Rico	26			0.69														0.33			

*Self-register not working

TABLE V.—*Data furnished by the Canadian Meteorological Service, February, 1905.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure, in inches. Sea level, reduced to mean of 24 hours.	Pressure, in inches. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Total snowfall.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F	29.64	29.78	—.05	22.9	+ 0.9	29.8	15.9	7.09	+2.18	21.9
Sydney, C. B. I	29.84	29.88	—.04	17.8	— 1.5	28.0	7.6	5.06	+0.97	29.0
Halifax, N. S	29.82	29.93	—.02	18.1	— 4.3	27.4	8.9	5.33	+0.17	37.4
Grand Manan, N. B	29.91	29.97	—.01	18.6	— 4.8	27.4	9.9	3.24	—0.73	32.2
Yarmouth, N. S	29.90	29.98	—.01	21.6	— 4.2	28.3	15.0	3.94	—0.80	34.9
Charlottetown, P. E. I	29.86	29.90	—.05	13.7	— 3.9	23.0	4.4	4.44	+1.38	36.2
Chatham, N. B	29.91	29.94	—.02	12.0	— 0.5	23.4	0.5	2.02	—1.14	20.2
Father Point, Que	29.97	30.00	+.02	9.0	— 2.5	17.7	0.2	1.87	—0.34	18.7
Quebec, Que	29.71	30.05	+.06	9.1	— 2.7	17.2	1.0	2.42	—0.85	24.2
Montreal, Que	29.88	30.11	+.09	10.3	— 4.2	18.2	2.3	3.89	+0.82	38.9
Rockliffe, Ont	29.47	30.04	+.03	5.9	— 4.0	18.5	— 6.8	1.83	—0.17	18.3
Ottawa, Ont	29.74	30.08	+.06	9.6	— 2.1	18.3	0.9	1.48	—1.21	14.8
Kingston, Ont	29.80	30.15	+.11	11.9	— 5.9	22.2	1.7	1.10	—1.44	11.0
Toronto, Ont	29.76	30.16	+.12	16.5	— 5.0	25.3	7.7	1.43	—1.18	13.7
White River, Ont	28.74	30.14	+.12	—0.2	— 0.4	15.0	—15.4	1.13	—0.39	11.3
Port Stanley, Ont	29.80	30.17	+.11	16.2	— 6.6	24.9	7.6	2.75	—0.46	26.9
Saugeen, Ont	29.39	30.13	+.11	15.0	— 4.9	23.5	6.5	2.34	—0.56	23.4
Parry Sound, Ont	29.34	30.14	+.13	10.4	— 3.9	21.0	— 0.1	3.05	+0.13	30.5
Port Arthur, Ont	29.42	30.17	+.12	8.4	+ 2.0	19.0	— 2.3	0.29	—0.61	2.9
Winnipeg, Man	29.31	30.21	+.11	1.6	+ 3.2	13.3	—10.1	0.27	—0.71	2.7
Minnedosa, Man	28.28	30.22	+.18	4.2	+ 6.9	17.2	— 8.9	0.10	—0.51	1.0
Qu'Appelle, Assin	27.77	30.15	+.07	6.4	+ 7.0	15.8	— 3.1	0.52	—0.21	5.2
Medicine Hat, Assin	27.75	30.14	+.09	13.5	+ 2.3	24.9	2.1	0.15	—0.52	1.5
Swift Current, Assin	27.45	30.17	+.10	11.6	+ 3.6	21.0	2.1	0.48	—0.26	4.6
Calgary, Alberta	26.40	30.11	+.12	14.4	+ 0.9	27.2	1.7	0.30	—0.33	3.0
Banff, Alberta	25.35	30.17	+.19	15.8	.....	27.6	3.9	0.30	—0.62	0.9
Edmonton, Alberta	27.67	30.08	+.06	12.7	+ 4.4	24.4	1.0	0.05	—0.62	0.4
Prince Albert, Sask	28.45	30.10	+.01	4.0	+ 7.0	15.8	— 7.6	0.32	—0.37	3.2
Battleford, Sask	28.33	30.18	+.09	5.3	+ 5.2	15.4	— 4.8	0.07	—0.30	0.7
Kamloops, B. C										
Victoria, B. C	29.96	30.06	+.06	41.7	+ 2.2	46.2	37.2	2.27	—1.83	
Barkerville, B. C	25.62	30.04	+.13	20.4	+ 1.5	28.6	12.3	1.76	—1.30	16.0
Hamilton, Bermuda	30.02	30.19	+.08	61.0	— 0.5	66.4	55.6	3.20	—1.24	

TABLE VI.—*Heights of rivers referred to zeros of gages, February, 1905.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Milk River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Havre, Mont.(22)	237	9						
James River.								
Huron, S. Dak.(27)	139	9						
Big Blue River.								
Blue Rapids, Kans.(28)	42	18	13.7	28				
Republican River.								
Clay Center, Kans.(22)	45	22	11.3	27				
Solomon River.								
Beloit, Kans (27)	75	16	18.0	26	— 1.3	22		19.3
Smoky Hill River.								
Lindsborg, Kans	109	20	10.2	22	1.7	1,9	3.1	8.5
Abilene, Kans	45	22	10.1	24	1.4	16	3.3	8.7
Kansas River.								
Manhattan, Kans	160	18	9.0	28	2.8	1–16	3.9	6.2
Topeka, Kans. (28)	87	21	12.2	28				
Osage River.								
Bagnell, Mo	70	28	14.5	28	2.5	1–23	3.4	12.0
Gasconade River.								
Arlington, Mo	98	16	4.0	28	— 1.8	8–17	—0.8	5.8
Missouri River.								
Bismarck, N. Dak	1,309	14	2.6	6–10	1.5	20	2.1	1.1
Pierre, S. Dak. (28)	1,114	14						
Sioux City, Iowa	784	19	7.8	27	5.0	1–16	5.4	2.8
Blair, Nebr	705	15	6.7	28	3.9	1	4.6	2.8
St. Joseph, Mo	481	10	4.3	28	1.0	1	1.8	3.3
Kansas City, Mo	388	21	12.3	27	6.6	2,3	7.6	5.7
Glasgow, Mo. (28)	231	18	11.1	28				
Boonville, Mo	199	20	13.1	28	5.4	5–9	6.4	7.7
Hermann, Mo. (27)	103	24	14.8	28				
Minnesota River.								
Mankato, Minn	127	18	4.4	28	1.9	1–11	2.2	2.5
St. Croix River.								
Stillwater, Minn. (28)	23	11						
Red Cedar River.								
Cedar Rapids, Iowa	77	14	3.8	19–21	3.4	1, 4, 5	3.6	0.4
Iowa River.								
Iowa City, Iowa (28)	57							
Des Moines River.								
Des Moines, Iowa (28)	205	19						
Illinois River.								
Peoria, Ill	135	14	11.6	28	9.2	1–8	9.6	2.4
Red Bank Creek.								
Brookville, Pa	35	8	1.0	1–28	1.0	1–28	1.0	0.0
Clarion River.								
Clarion, Pa	32	10	3.7	1	— 0.1	27	1.6	3.8
Conemaugh River.								
Johnstown, Pa. (28)	64	7	3.0	27, 28				
Allegheny River.								
Warren, Pa. (28)	177	14						
Oil City, Pa	123	13	2.4	28	1.5	5–12	1.9	0.9
Parker, Pa. (28)	73	20						
Freeport, Pa. (28)	29	20						
Cheat River.								
Rowlesburg, W. Va. (28)	36	14						
Youghiogheny River.								
Confluence, Pa. (28)	59	10						
West Newton, Pa. (28)	15	23						
Monongahela River.								
Weston, W. Va. (3)	161	18	8.3	9	— 0.5	6	0.8	8.8
Fairmont, W. Va	119	25	23.3	10	14.8	1–6	16.5	8.5
Greensboro, Pa. (1)	81	18	13.5	10	6.4	1–8	8.6	7.1
Lock No. 4, Pa	40	28	16.0	11	6.5	3–8	9.2	9.5

TABLE VI.—*Heights of rivers referred to zeros of gages.*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Beaver River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Ellwood Junction, Pa. (22)	10	14	.....	.....	.....	.....	.....	.....
Muskingum River.								
Zanesville, Ohio	70	25	11.8	27, 28	7.6	7, 8	8.7	4.2
Little Kanawha River.								
Glenville, W. Va	77	20	10.0	9	0.0	4	2.0	10.0
Creston, W. Va	38	20	20.0	10	3.0	1–8	5.4	17.0
Great Kanawha, River.								
Charleston, W. Va	58	30	8.5	24	1.7	5–8	4.7	6.8
New River.								
Radford, Va	155	14	6.8	23	0.3	7, 8	1.4	6.5
Hinton, W. Va	95	14	6.0	23	1.5	1–9	2.4	4.5
Scioto River.								
Columbus, Ohio (23)	110	17	5.4	27, 28	.....	.....	.....	.....
Licking River.								
Falmouth, Ky. (13)	30	25	7.0	17	3.0	10	4.7	4.0
Miami River.								
Dayton, Ohio (21)	77	18	4.3	26	.....	.....	.....	.....
Kentucky River.								
Jackson, Ky	287	24	11.0	10	4.0	1–8	5.9	7.0
Beattyville, Ky	254	30	14.4	10	0.4	2–8	2.4	14.0
High Bridge, Ky	117	17	14.6	12	9.1	7–8	11.2	5.5
Frankfort, Ky	65	31	10.6	12	6.0	1–8	7.6	4.6
Wabash River.								
Terre Haute, Ind	171	16	11.6	28	— 1.0	21, 22	1.1	12.6
Mount Carmel, Ill. (27)	75	15	12.0	28	.....	.....	.....	.....
Cumberland River.								
Burnside, Ky	518	50	28.8	10	2.5	1–5	8.3	26.3
Celina, Tenn	383	45	26.0	12	2.4	4, 5	10.6	23.6
Carthage, Tenn	308	40	26.0	13	2.0	5	10.7	24.0
Nashville, Tenn	193	40	29.6	13	8.1	4, 5	16.9	21.5
Clarksville, Tenn	126	42	33.7	14	4.7	2	18.8	29.0
Powell River.								
Tazewell, Tenn. (7)	44	20	11.2	10	1.5	8	4.3	9.7
Clinch River.								
Speers Ferry, Va	156	20	9.0	9	— 0.2	4	2.3	9.2
Clinton, Tenn. (1)	52	25	19.0	11	4.0	3	10.0	15.0
South Fork Holston River.								
Bluff City, Tenn.	35	15	5.4	9	0.5	4	2.5	4.9
Holston River.								
Rotherwood, Tenn	142	14	6.0	9	0.6	3, 4	2.3	5.4
Rogersville, Tenn	103	14	8.4	9	1.8	1, 2, 5	3.7	6.6
French Broad River.								
Asheville, N. C	144	6	2.5	21	— 0.6	3–6	0.5	3.1
Leadvale, Tenn	70	15	5.5	21	— 0.4	4	1.6	5.9
Little Tennessee River.								
McGhee, Tenn	17	20	14.0	9	2.8	3	5.7	11.2
Hiwassee River.								
Charleston, Tenn	18	22	18.0	21	1.2	4	5.4	16.8
Tennessee River.								
Knoxville, Tenn	635	29	11.0	22	1.1	4, 5	5.4	9.9
Loudon, Tenn	590	25	10.5	21	1.2	5	5.2	9.3
Kingston, Tenn	556	25	13.1	10	2.0	5	6.6	11.1
Chattanooga, Tenn	452	33	22.4	11	2.8	1	11.5	19.6
Bridgeport, Ala	402	24	17.6	11, 12	1.5	1	9.4	16.1
Guntersville, Ala	349	31	25.3	12	3.5	1	15.6	21.8
Florence, Ala	255	16	16.7	12, 13	2.1	3	10.5	14.6
Riverton, Ala	225	26	26.5	13	3.9	4	17.8	22.6
Johnsonville, Tenn	95	21	24.0	14, 15	4.2	5	16.4	19.8
Ohio River.								
Pittsburg, Pa	966	22	7.3	11	1.0	6	3.0	6.3
Davis Island Dam, Pa	960	25	8.6	11	3.8	1	5.2	4.8
Beaver Dam, Pa	925	27	12.5	11	5.5	22, 23	8.4	7.0
Wheeling, W. Va. (6)	875	36	17.6	12	4.4	1, 2	10.7	13.2
Parkersburg, W. Va. (15)	785	36	9.8	27	.....	.....	.....	.....
Point Pleasant, W. Va	703	39	11.6	28	2.6	3	6.8	9.0
Huntington, W. Va	660	50	15.5	28	5.0	3	10.9	10.5
Catlettsburg, Ky	651	50	15.9	12	3.6	2, 3	10.6	12.3
Portsmouth, Ohio	612	50	23.8	20	4.5	3	14.5	19.3
Maysville, Ky	559	50	28.0	27, 28	5.4	4, 6	16.4	22.6
Cincinnati, Ohio	499	50	33.7	28	8.6	2	21.4	25.1
Madison, Ind	413	46	21.8	26	9.0	8, 9	15.6	12.8
Louisville, Ky	367	28	8.3	27	3.1	9	5.4	5.2
Evansville, Ind	184	35	18.7	28	5.4	2–4	11.2	13.3
Mount Vernon, Ind. (17)	148	35	17.0	28	.....	.....	.....	.....
Paducah, Ky	47	40	22.0	28	6.7	1–9	13.8	15.3
Cairo, Ill	1	45	25.6	28	8.2	4	17.0	17.4
St. Francis River.								
Marked Tree, Ark. (8)	104	17	7.9	26–28	5.1	9	6.4	2.8
Neosho River.								
Neosho Rapids, Kans	326	22	6.8	25	0.2	1–18	1.2	6.6
Iola, Kans. (23)	262	10	2.7	27	.....	.....	.....	.....
Oswego, Kans	184	20	7.7	26	0.1	11, 13–20	0.9	7.6
Fort Gibson, Ind. T. (21)	3	22	16.1	28	.....	.....	.....	.....
Canadian River.								
Calvin, Ind. T. (20)	99	10	3.5	26	.....	.....	.....	.....
Black River.								
Blackrock, Ark	67	12	4.0	28	1.6	17–20	2.0	2.4
White River.								
Calicorock, Ark	272	15	6.7	28	— 0.4	4, 15–20	0.4	7.1
Batesville, Ark	217	18	6.9	28	2.5	5–7, 16, 17	3.1	4.4
Newport, Ark	185	26	4.5	28	1.0	14, 18, 19	1.6	3.5
Clarendon, Ark	75	30	11.8	28	8.2	7–10	9.9	3.6
Arkansas River.								
Wichita, Kans	832	10	1.9	28	— 0.1	20, 21	0.4	2.0
Tulsa, Ind. T. (23)	551	16	6.0	24	.....	.....	.....	.....
Webbers Falls, Ind. T. (20)	465	23	11.3	27, 28	.....	.....	.....	.....
Fort Smith, Ark	403	22	11.7	28	1.0	5, 6	3.2	10.7
Dardanelle, Ark	256	21	9.5	28	1.6	9, 10	3.2	7.9
Little Rock, Ark. (12)(a)	176	23	9.2	28	4.2	11	5.4	5.0
Yazoo River.								
Greenwood, Miss	175	38	29.6	23, 24	25.4	2–4	27.1	4.2
Yazoo City, Miss	80	25	21.2	20	17.3	1, 2	19.6	3.9
Ouachita River.								
Camden, Ark	304	39	23.7	25	12.5	9, 10	18.6	11.2
Ouachita River—Cont'd.								
Monroe, La	122	40	30.3	28	27.0	1	28.5	3.3
Red River.								
Arthur City, Tex	688	27	9.0	25	4.5	1–18	5.4	4.5
Fulton, Ark	515	28	11.1	28	5.7	1–3	8.3	5.4
Springbank	441	29	13.1	26, 27	5.9	3, 4	9.3	7.2
Shreveport, La	327	29	8.2	21	2.2	4, 5	5.1	6.0
Alexandria, La	118	33	18.8	23	7.3	4, 6	11.7	11.5
Mississippi River.								
St. Cloud, Minn. (23)	2,034	4	.....	.....	.....	.....	.....	.....
St. Paul, Minn. (23)	1,954	14	.....	.....	.....	.....	.....	.....
Red Wing, Minn. (23)	1,914	14	.....	.....	.....	.....	.....	.....
Reeds Landing, Minn (23)	1,884	12	.....	.....	.....	.....	.....	.....
La Crosse, Wis. (23)	1,819	12	.....	.....	.....	.....	.....	.....
Prairie du Chien, Wis. (23)	1,759	18	.....	.....	.....	.....	.....	.....
Dubuque, Iowa (23)	1,699	18	.....	.....	.....	.....	.....	.....
Clinton, Iowa (23)	1,629	16	.....	.....	.....	.....	.....	.....
Leclaire, Iowa (23)	1,609	10	.....	.....	.....	.....	.....	.....
Davenport, Iowa (23)	1,593	15	.....	.....	.....	.....	.....	.....
Muscatine, Iowa	1,562	16	4.9	27, 28	3.8	3–8	4.1	1.1
Galland, Iowa (23)	1,472	8	.....	.....	.....	.....	.....	.....
Keokuk, Iowa (23)	1,463	15	.....	.....	.....	.....	.....	.....
Warsaw, Ill. (23)	1,458	18	9.3	28	.....	.....	.....	.....
Hannibal, Mo. (23)	1,402	13	9.2	28	.....	.....	.....	.....
Grafton, Ill. (1)	1,306	23	11.5	28	5.8	3, 4, 21, 22	6.4	5.7
St. Louis, Mo. (20)	1,264	30	18.0	28	.....	.....	.....	.....
Chester, Ill. (1)	1,189	30	9.0	27	5.3	15–17	6.2	3.7
Cape Girardeau, Mo	1,128	28	12.5	28	6.7	1, 2	9.4	5.8
New Madrid, Mo	1,003	34	20.3	28	4.3	8	12.1	16.0
Luxora, Ark. (8)	905	33	13.1	28	0.3	8	6.5	12.8
Memphis, Tenn. (8)	843	33	15.4	28	2.5	11	10.2	12.9
Helena, Ark	767	42	19.0	28	4.4	10	11.7	14.6
Arkansas City, Ark	635	42	20.6	22	5.4	10–12	13.6	15.2
Greenville, Miss	595	42	16.5	22	4.5	11, 12	10.6	12.0
Vicksburg, Miss	474	45	19.2	24	5.7	12, 14	12.1	13.5
Natchez, Miss	373	46	22.0	27	11.4	16	16.1	10.6
Baton Rouge, La	240	35	16.0	27, 28	8.6	16, 17	11.5	7.4
Donaldsonville, La	188	28	11.5	26, 27	5.7	16	8.0	5.8
New Orleans, La	108	16	7.5	27, 28	4.4	16	5.8	3.1
Atchafalaya River.								
Simmesport, La	127	.....	21.6	27	15.5	7, 8	17.4	6.1
Melville, La	103	31	24.7	26, 27	19.3	7	21.1	5.4
Morgan City, La	19	8	4.0	8	1.6	14	2.8	2.4
Penobscot River.								
Mattawamkeag, Me. (23)	87	.....	.....	.....	.....	.....	.....	.....
West Enfield, Me. (23)	60	.....	.....	.....	.....	.....	.....	.....
Kennebec River.								
Winslow, Me. (23)	46	.....	4.6	20	2.9	26	4.0	1.7
Merrimac River.								
Franklin Junction, N. H. (23)	110	.....	.....	.....	.....	.....	.....	.....
Concord, N. H. (23)	94	.....	.....	.....	.....	.....	.....	.....
Manchester, N. H	68	.....	2.7	2, 6, 8, 20, 22	2.0	25	2.5	0.7
Connecticut River.								
Wells River, Vt. (23)	255	.....	.....	.....	.....	.....	.....	.....
Whiteriver Junction, Vt (23)	209	.....	.....	.....	.....	.....	.....	.....
Bellows Falls, Vt	170	12	2.3	5, 19	— 0.3	10, 11, 17, 18	0.8	2.6
Holyoke, Mass	84	9	3.0	12	— 0.3	4	1.4	3.3
Hartford, Conn. (23)	50	13	.....	.....	.....	.....	.....	.....
Housatonic River.								
Gaylordsville, Conn	44	15	4.5	2, 3, 5, 8	4.0	23, 24	4.3	0.5
Mohawk River.								
Tribeshill, N. Y	42	15	2.4	2, 3	2.0	5–9, 11–18	2.2	0.4
Schenectady, N. Y	19	15	1.2	1, 2	0.8	22–28	1.0	0.4
Hudson River.								
Glens Falls, N. Y	197	8	6.6	6	4.2	28	5.2	2.4
Troy, N. Y	154	14	3.5	5	2.0	22	2.9	1.5
Albany, N. Y	147	12	4.1	23	0.5	14	2.3	3.6
Stuyvesant, N. Y	128	9	4.2	25	— 1.5	15	0.8	5.7
Pompton River.								
Pompton Plains, N. J. (25)	6	8	4.5	13	.....	.....	.....	.....
Passaic River.								
Chatham, N. J. (23)	69	7	.....	.....	.....	.....	.....	.....
Lehigh River.								
Mauchchunk, Pa. (23)	45	15	.....	.....	.....	.....	.....	.....
Schuylkill River.								
Reading, Pa	66	12	0.5	6, 28	0.1	11, 12, 18–24	0.2	0.4
Delaware River.								
Hancock (E. Branch), N. Y.	269	12	4.9	1	4.3	21, 25, 27, 28	4.5	0.6
Hancock (W. Branch), N. Y.	269	10	4.5	1	3.3	9	3.9	1.2
Port Jervis, N. Y. (23)	204	14	1.4	4, 5	.....	.....	.....	.....
Phillipsburg, N. J. (25)	142	26	1.7	26	.....	.....	.....	.....
Trenton, N. J.	92	18	4.6	18, 19	3.0	11, 12, 23	3.9	1.6
North Branch Susquehanna.								
Binghamton, N. Y	183	16	3.5	14, 15	2.2	26, 28	2.9	1.3
Towanda, Pa. (23)	139	16	.....	.....	.....	.....	.....	.....
Wilkesbarre, Pa	60	17	6.8	1	3.8	28	5.1	3.0
West Branch Susquehanna.								
Clearfield, Pa. (23)	165	8	.....	.....	.....	.....	.....	.....
Lockhaven, Pa. (23)	65	12	.....	.....	.....	.....	.....	.....
Williamsport, Pa	39	20	2.9	1, 2	1.7	23–25	2.1	1.2
Juniata River.								
Huntingdon, Pa	90	24	4.1	27	3.4	26	3.8	0.7
Susquehanna River.								
Selinsgrove, Pa. (23)	116	17	2.0	1, 2	.....	.....	.....	.....
Harrisburg, Pa	69	17	4.8	1–3	3.5	27	4.1	1.3
Shenandoah River.								
Riverton, Va	58	22	8.0	28	0.5	1–27	0.8	7.5
Potomac River.								
Cumberland, Md.	290	8	3.8	23	2.6	6, 7	3.1	1.2
Harpers Ferry, W. Va. (1)	172	18	1.5	1	0.0	23, 24	0.6	1.5
James River.								
Buchanan, Va. (1)	305	12	3.9	27	2.0	4–13	2.6	1.9
Lynchburg, Va. (10)	260	18	2.7	28	0.3	9–11	1.1	2.4
Columbia, Va	167	18	8.0	27	3.0	3	4.5	5.0
Richmond, Va	111	12	2.0	26	— 0.8	8	0.3	2.8

TABLE VI.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Dan River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Danville, Va.	55	8	4.6	21	— 0.3	1,7,8	0.8	4.9
Roanoke River.								
Weldon, N. C.	129	30	31.0	23	8.4	2	15.7	22.6
Cape Fear River.								
Fayetteville, N. C.	112	38	46.4	22	5.8	2,6	20.1	40.6
Waccamaw River.								
Conway, S. C.	40	7	6.6	26-28	1.8	3	4.0	4.8
Pedee River.								
Cheraw, S. C.	149	27	33.8	22	2.0	1	13.3	31.8
Smiths Mills, S. C.	51	16	15.8	28	4.2	2	9.9	11.6
Lynch Creek.								
Effingham, S. C.	35	12	13.5	21	4.4	5,6	8.3	9.1
Black River.								
Kingstree, S. C.	45	12	10.7	21	4.0	10,11	7.1	6.7
Catawba River.								
Mount Holly, N. C.	28	15	5.8	21	1.6	1-6	2.6	4.2
Wateree River.								
Camden, S. C.	37	24	28.1	22	4.4	6	13.2	23.7
Congaree River.								
Columbia, S. C.	52	15	14.7	22	0.5	1	4.5	14.2
Santee River.								
St. Stephens, S. C.	59	12	10.4	22,23	1.9	3	6.3	8.5
Edisto River.								
Edisto, S. C.	75	6	5.8	21-23	2.0	2-7	3.8	3.8
Broad River.								
Carlton, Ga.	30	11	8.5	22	2.0	1-5	3.8	6.5
Savannah River.								
Calhoun Falls, S. C.	347	15	8.6	13	2.2	2,3	4.4	6.4
Augusta, Ga.	268	32	25.8	14	6.9	4	13.3	18.9
Oconee River.								
Milledgeville, Ga.	147	25	21.0	13	2.0	5	7.2	19.0
Dublin, Ga.	79	30	19.5	16,17	0.6	4,5	8.5	18.9
Ocmulgee River.								
Macon, Ga.	203	18	17.0	13	1.9	4	7.2	15.1
Abbeville, Ga.	96	11	15.8	18,19	2.9	5,6	9.3	12.9
Flint River.								
Woodbury, Ga.	227	10	6.3	14	0.4	3,4	2.1	5.9
Montezuma, Ga.	152	20	17.3	15	3.2	1-5	5.4	14.1
Albany, Ga.	99	20	25.5	16	2.2	1,5,6	12.1	23.3
Bainbridge, Ga.	29	22	23.6	19	4.4	7	13.3	19.2
Chattahoochee River.								
West Point, Ga.	239	20	9.3	23	2.4	3,4	5.2	6.9
Eufaula, Ala.	90	40	39.0	13,14	2.0	1-4	12.7	37.0
Alaga, Ala.	30	25	34.0	14	3.6	5	14.1	30.4
Coosa River.								
Rome, Ga.	271	30	20.5	22	1.2	2-6	8.9	19.3
Gadsden, Ala.	144	22	19.9	11,12	2.3	2-4	11.6	17.6
Lock No. 4, Ala.	116	17	16.7	10	2.1	5	10.1	14.6
Wetumpka, Ala.	6	45	38.5	14	6.4	4,5	21.6	32.1
Tallapoosa River.								
Milstead, Ala.	38	35	28.6	13	2.0	2	9.3	26.6
Alabama River.								
Montgomery, Ala.	265	35	38.2	15	4.1	3,4	19.6	34.1
Selma, Ala.	212	35	42.0	16	4.5	1	22.6	37.5
Black Warrior River.								
Tuscaloosa, Ala.	90	43	37.1	10	13.1	5	34.6	44.0
Tombigbee River.								
Columbus, Miss.	303	33	26.0	23	2.5	1-3	14.7	23.5
Vienna, Ala.	233	42	36.7	15,16	11.0	1	27.7	25.7
Demopolis, Ala.	155	35	55.4	18	17.2	1	43.6	38.2
Leaf River.								
Hattiesburg, Miss.	60	20	20.5	12	4.9	4	11.7	15.6
Chickasawhay River.								
Enterprise, Miss.	144	18	28.8	10	3.7	4	13.5	25.1
Shubuta, Miss.	106	25	40.0	12	8.0	2	24.1	32.0
Pascagoula River.								
Merrill, Miss.	78	20	23.5	15	7.8	1	17.3	15.7
Pearl River.								
Jackson, Miss.	242	20	29.2	17	6.0	3	21.9	23.2
Columbia, Miss.	110	14	23.0	13	8.9	5	18.0	14.1
Sabine River.								
Logansport, La.	315	25	24.8	24,26	7.0	6	17.8	17.8
Neches River.								
Rockland, Tex.	105	20	10.1	21,22	3.8	3	7.6	6.3
Beaumont, Tex.	18	10	2.6	19	0.8	1,2,6,7	1.6	1.8
Trinity River.								
Dallas, Tex.	320	25	8.1	20	2.5	3-5	4.0	5.6
Long Lake, Tex.	211	35	21.3	25	2.8	1	9.7	18.5
Riverside, Tex.	112	40	12.2	22	1.5	1	6.6	10.7
Liberty, Tex.	20	25	17.8	23	4.5	1	10.3	13.3
Brazos River.								
Kopperl, Tex. (7)	345	21	2.0	19	0.6	1,2	1.3	1.4
Waco, Tex.	285	24	5.1	20	2.7	4,10	3.2	2.4
Hempstead, Tex.	140	40	8.6	20	— 1.9	1,4	0.8	9.9
Booth, Tex.	61	39	6.7	27	1.3	11	3.3	5.4
Colorado River.								
Ballinger, Tex.	489	21	1.6	8-14,18-21	1.5	{1-7, 15-17, 22-28}	1.5	0.1
Austin, Tex.	214	18	1.5	23,24	0.7	13	1.2	0.8
Columbus, Tex.	98	24	14.5	19	5.8	1,2,5-8	7.0	8.7
Guadalupe River.								
Gonzales, Tex.	112	22	1.4	19	0.5	5	0.7	0.9
Victoria, Tex.	35	16	15.6	29	1.5	6,14	3.6	14.1
Red River of the North.								
Moorhead, Minn. (28)	284	26	.....	.....	.....	.....	.....	.....
Kootenai River.								
Bonners Ferry, Idaho(29)	123	24	.....	.....	.....	.....	.....	.....
Pend d'Oreille River.								
Newport, Wash. (13)	86	14	— 1.1	10	— 2.5	2,3	—1.7	1.4
Snake River.								
Lewiston, Idaho	144	24	3.4	27,28	1.0	13	2.0	2.4
Columbia River.								
Wenatchee, Wash.	473	40	4.5	1	3.2	15,16	3.7	1.3
Umatilla, Oreg. (7)	270	25	0.2	28	— 3.3	19-21	—1.6	3.5
The Dalles, Oreg.	166	40	1.6	28	— 1.7	16	—0.1	3.3
Willamette River.								
Eugene, Oreg.	183	10	5.4	1,2	3.4	16-18	4.4	2.0
Albany, Oreg.	118	20	5.8	1	2.9	15-17	4.2	2.9
Salem, Oreg.	84	20	5.4	1,24	2.1	17,18	3.5	3.3
Portland, Oreg.	12	15	5.2	23	0.5	15	3.2	4.7
Sacramento River.								
Red Bluff, Cal.	201	23	19.3	2	4.6	18,19	8.4	14.7
Sacramento, Cal.	64	25	22.0	6,7	19.8	28	20.9	2.2

Small figures indicate number of days river was frozen. (*) Five days missing.

RAINFALL IN JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the accompanying table in advance of the regular monthly weather report for Jamaica:

The rainfall for February was below the average for the whole island. The greatest rainfall, 13.91 inches, was recorded at Port Maria, in the northern division, while no rain fell at Aligator Pond in the southern division.

Comparative table of rainfall for February, 1905.

[Based upon the average stations only.]

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1905.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	26	5.40	5.59
Northern division	22	48	2.64	2.65
West-central division	26	21	2.36	2.37
Southern division	27	35	1.57	1.59
Means	100	130	2.99	3.05

Honolulu, Hawaii, latitude, 21° 19′ north, longitude 157° 52′ west; barometer above sea, 38 feet; gravity correction, —.057 applied. February, 1905.

Day.	Pressure.*		Air temperature.				Moisture.				Wind.				Precipitation.		Clouds.					
							8 a. m.		8 p. m.		8 a. m.		8 p. m.				8 a. m.			8 p. m.		
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Maximum.	Minimum.	Wet.	Relative humidity.	Wet.	Relative humidity.	Direction.	Velocity.	Direction.	Velocity.	8 a. m.	8 p. m.	Amount.	Kind.	Direction.	Amount.	Kind.	Direction.
1	30.10	30.05	65.8	67.0	70	63	58.5	65	58.2	59	ne.	13	e.	9	T.	T.	1 8	Ci.-s S.-cu.	0 e.	8	S.-cu.	ne.
2	30.05	30.01	68.2	67.0	72	63	61.2	67	61.9	75	e.	2	ne.	5	T.	0.01	3 2	Ci.-s S.-cu.	w. e.	10	N.	0
3	29.99	29.97	68.0	69.0	74	63	63.2	77	63.5	74	e.	4	ne.	8	0.01	T.	5 3	Ci.-s S.-cu.	sw. e.	7	S.-cu.	ne.
4	29.95	29.91	70.8	70.0	76	67	63.3	66	63.4	70	ne.	10	sw.	7	0.01	0.00	5	S.-cu.	e.	4	S.-cu.	ne.
5	29.88	29.85	70.0	69.0	77	65	64.1	72	65.0	81	e.	2	ne.	6	T.	0.00	1	S.-cu.	ne.	8	S.-cu.	ne.
6	29.90	29.88	70.3	69.0	74	64	66.3	81	64.1	77	ne.	2	n.	3	0.00	0.00	2	S.-cu.	0	2	S.-cu.	w.
7	29.91	29.92	71.0	69.0	76	64	65.4	74	62.1	68	n.	4	n.	4	0.00	0.00	2	S.-cu.	w.	1	S.-cu.	0
8	29.96	29.94	70.3	70.0	77	64	63.3	68	64.1	72	ne.	2	ne.	9	0.00	0.00	2 1	Ci.-cu. S.-cu.	w. 0	1	S.-cu.	0
9	29.97	29.96	70.3	69.0	77	64	64.1	71	65.0	81	ne.	3	ne.	4	0.00	0.25	1	S.-cu.	0	4	S.-cu.	sw.
10	29.97	30.02	70.8	69.2	77	67	65.0	73	62.0	66	n.	4	ne.	15	0.00	0.00	5	S.-cu.	ne.	few.	S.-cu.	0
11	30.01	30.02	69.4	69.4	75	63	62.0	66	62.0	66	se.	4	ne.	10	0.00	0.00	1	S.-cu.	e.	1	S.-cu.	e.
12	30.02	30.02	69.4	68.5	73	65	60.1	58	61.0	65	ne.	6	ne.	5	0.00	0.00	2	S.-cu.	e.	few.	S.-cu.	0
13	30.02	29.99	68.7	68.4	77	64	61.8	68	62.0	70	ne.	6	ne.	5	0.00	0.00	1	S.-cu.	e.	4 1	A.-cu. S.-cu.	w. ne.
14	30.00	29.96	67.4	66.4	73	60	59.8	64	61.0	73	ne.	2	n.	5	0.00	0.00	1	S.-cu.	0	few.	S.-cu.	0
15	29.99	29.98	68.8	67.8	73	60	62.8	72	62.0	72	ne.	3	n.	5	0.00	0.00	few.	S.-cu.	e.	few.	S.-cu.	ne.
16	30.00	29.99	69.4	70.0	74	62	62.4	67	63.5	70	ne.	2	nw.	3	0.00	0.00	few.	S.-cu.	0	1	S.-cu.	ne.
17	30.01	30.01	70.1	69.0	76	67	63.4	69	62.0	67	nw.	4	n.	5	0.00	T.	10	S.-cu.	sw.	2 6	Cl.-s. Cl.-cu.	w. w.
18	30.06	30.04	69.0	67.2	74	64	58.7	54	59.2	62	ne.	5	ne.	13	0.00	0.00	few.	S.-cu.	ne.	few.	S.-cu.	ne.
19	30.06	30.02	64.2	66.8	75	61	57.3	66	60.0	67	n.	1	ne.	6	0.00	0.00	few.	S.-cu.	ne.	0	0	0
20	30.07	30.02	69.7	69.0	74	60	60.7	59	62.0	67	e.	4	ne.	6	0.00	0.00	few.	S.-cu.	0	few.	S.-cu.	ne.
21	30.05	30.00	69.4	68.5	75	63	61.2	62	61.5	67	ne.	2	ne.	2	0.00	0.00	1	S.-cu.	ne.	1	S.-cu.	ne.
22	30.00	29.98	72.5	69.4	76	64	64.9	67	62.9	70	s.	5	e.	5	0.00	0.00	2	S.-cu.	s.	few.	S.-cu.	0
23	29.99	29.92	69.4	71.7	76	64	64.9	79	61.2	55	ne.	4	e.	5	0.00	0.00	6 4	Cu. S.-cu.	s. ne.	few.	S.-cu.	0
24	29.98	29.95	71.2	70.3	76	64	66.0	76	66.0	80	ne.	3	se.	2	0.00	T.	7 2	A.-cu. S.-cu.	sw. 0	1	S.-cu.	0
25	29.98	29.96	70.2	70.0	77	66	66.2	81	64.5	74	e.	4	sw.	2	0.00	T.	5	S.-cu.	0	2	S.-cu.	0
26	29.98	29.98	72.4	69.4	75	64	66.4	73	62.9	70	ne.	2	ne.	4	0.00	0.00	1	A.-cu.	0	1	S.-cu.	0
27	30.01	30.00	71.0	73.0	78	64	64.0	68	62.0	53	s.	2	w.	2	0.00	0.00	10	A.-cu.	se.	9	S.-cu.	sw.
28	30.04	30.02	71.8	72.9	77	66	66.2	75	67.0	73	sw.	6	sw.	5	0.00	0.00	9	S.-cu.	sw.	2	S.-cu.	sw.
Mean	29.998	29.978	69.6	69.1	75.1	63.8	63.0	69.2	62.6	69.4	ne.	4.0	ne.	5.7	0.02	0.26	3.6	S.-cu.	e.	2.7	S.-cu.	ne.

Observations are made at 8 a. m. and 8 p. m., local standard time, which is that of 157° 30′ west, and is 5h and 30m slower than 75th meridian time. *Pressure values are reduced to sea level and standard gravity.

COSTA RICAN CLIMATOLOGICAL DATA.

Communicated by Mr. H. PITTIER, Director, Physico-Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San José de Costa Rica, during February, 1905.*

Hours.	Pressure.	Temperature.	Relative humidity.	Rainfall.		Sunshine.	Cloudiness.	Temperature of the soil at depth of—			
				Amount.	Duration.			6 inches.	12 inches.	24 inches.	48 inches.
	Inches.	° *F.*	%	*Ins.*	*Hrs.*	*Hrs.*	%	° *F.*	° *F.*	° *F.*	° *F.*
1 a. m	26.16	60.5	80	.....	.....	.....	.....	.....	.....	.....	.....
2 a. m	26.15	60.0	81	.....	.....	.....	.....	.....	.....	.....	.....
3 a. m	26.13	59.6	79	.....	.....	.....	.....	.....	.....	.....	.....
4 a. m	26.13	59.5	79	.....	.....	.....	.....	.....	.....	.....	.....
5 a. m	26.13	59.4	79	.....	.....	.....	.....	.....	.....	.....	.....
6 a. m	26.14	59.3	78	.....	.....	.....	.....	.....	.....	.....	.....
7 a. m	26.15	59.2	78	.....	.....	9.76	30	.....	70.9	71.1	70.1
8 a. m	26.16	61.6	74	.....	.....	23.12	.....	.....	.....	.....	.....
9 a. m	26.17	65.8	66	.....	.....	22.96	.....	.....	.....	.....	.....
10 a. m	26.18	70.5	57	.....	.....	22.24	33	70.5	70.6	71.2	70.2
11 a. m	26.17	72.9	53	.....	.....	21.92	.....	.....	.....	.....	.....
Noon	26.16	75.0	51	.....	.....	22.34	.....	.....	.....	.....	.....
1 p. m	26.14	76.7	50	.....	.....	23.53	37	71.8	71.1	71.2	70.2
2 p. m	26.11	77.0	50	.....	.....	23.99	.....	.....	.....	.....	.....
3 p. m	26.10	75.7	53	.....	.....	23.01	.....	.....	.....	.....	.....
4 p. m	26.09	73.4	57	.....	.....	18.92	59	72.8	.....	.....	70.2
5 p. m	26.09	70.0	63	.....	.....	14.94	.....	.....	.....	.....	.....
6 p. m	26.10	66.6	70	.....	.....	5.17	.....	.....	.....	.....	.....
7 p. m	26.12	64.3	74	.....	.....	.....	53	72.6	71.9	.....	70.1
8 p. m	26.14	63.1	77	.....	.....	.....	.....	.....	.....	.....	.....
9 p. m	26.16	62.3	76	.....	.....	.....	.....	.....	.....	.....	.....
10 p. m	26.17	61.6	78	.....	.....	.....	25	72.1	71.8	.....	70.2
11 p. m	26.18	61.2	78	.....	.....	.....	.....	.....	.....	.....	.....
Midnight	26.17	62.4	80	.....	.....	.....	.....	.....	.....	.....	.....
Mean	26.14	63.9	70	.....	.....	.....	39	71.1	71.3	71.2	70.2
Min	26.03	51.4	33	.....	.....	.....	.....	.....	.....	.....	.....
Max	26.23	83.3	100	.....	.....	.....	.....	.....	.....	.....	.....
Total	.....	.....	.....	0.00	.....	231.90	.....	.....	.....	.....	.....

REMARKS.—At San José the barometer is 3835 feet above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 5 feet above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. The standard rain gage is 5 feet above ground. Since January 1, 1902, observations at San José have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San José local time.

TABLE 2.—*Rainfall at stations in Costa Rica, February, 1905.*

Stations.	Rainfall.		Stations.	Rainfall.	
	Amount.	Number of days.		Amount.	Number of days.
	Inches.			*Inches.*	
Bearesem	2.24	2	Las Lomas	0.43	13
Zent	2.56	13	Peralta	0.55	8
Iroquois	3.58	22	Santiago	1.18	4
Guapiles	21.46	19	Cachi	0.51	8
San Carlos	1.89	12	Las Concavas	1.02	6

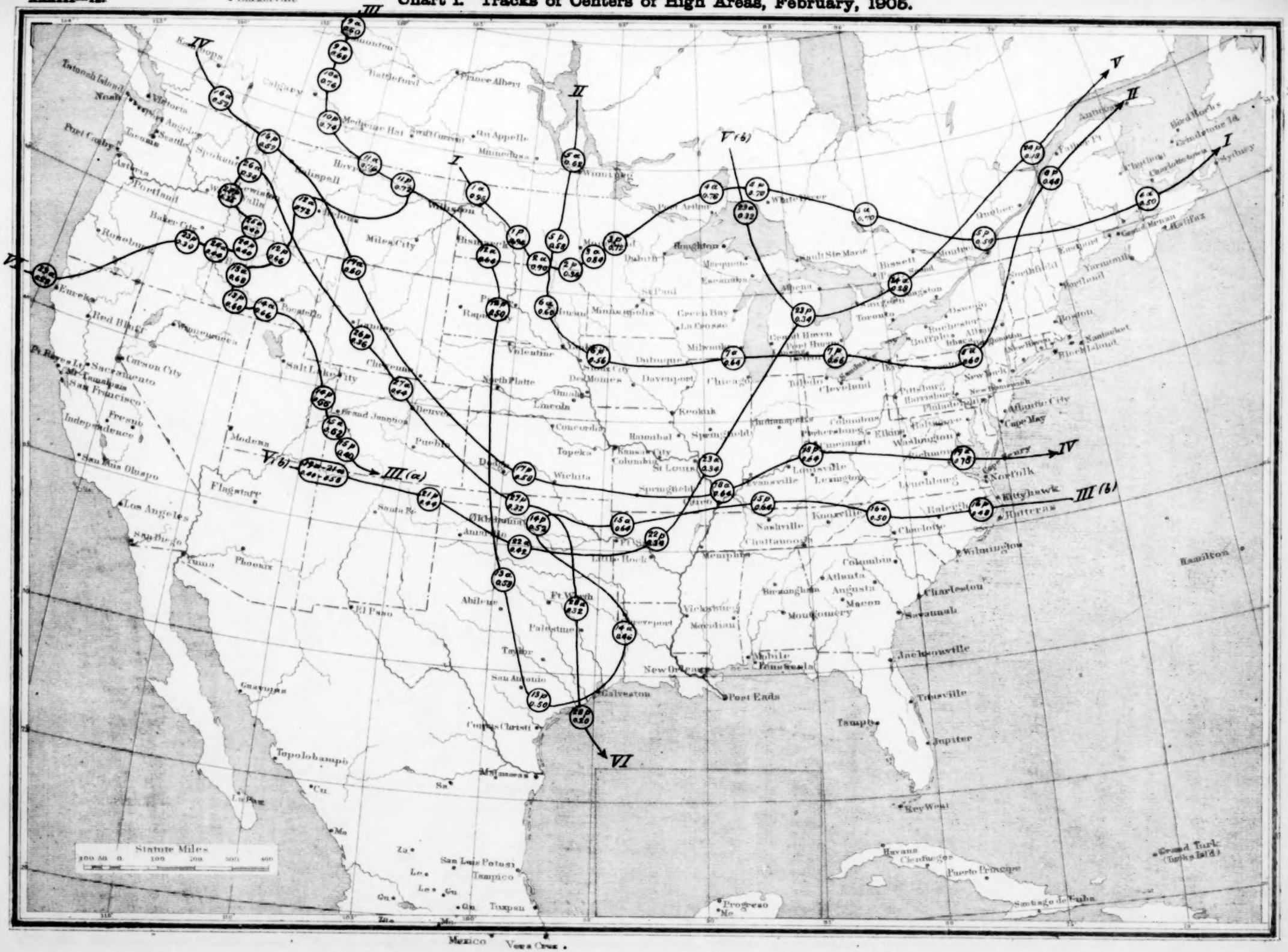
Notes on earthquakes.—February 5, very slight shock indeterminate elements.

Barkerville

Chart I. Tracks of Centers of High Areas, February, 1905.

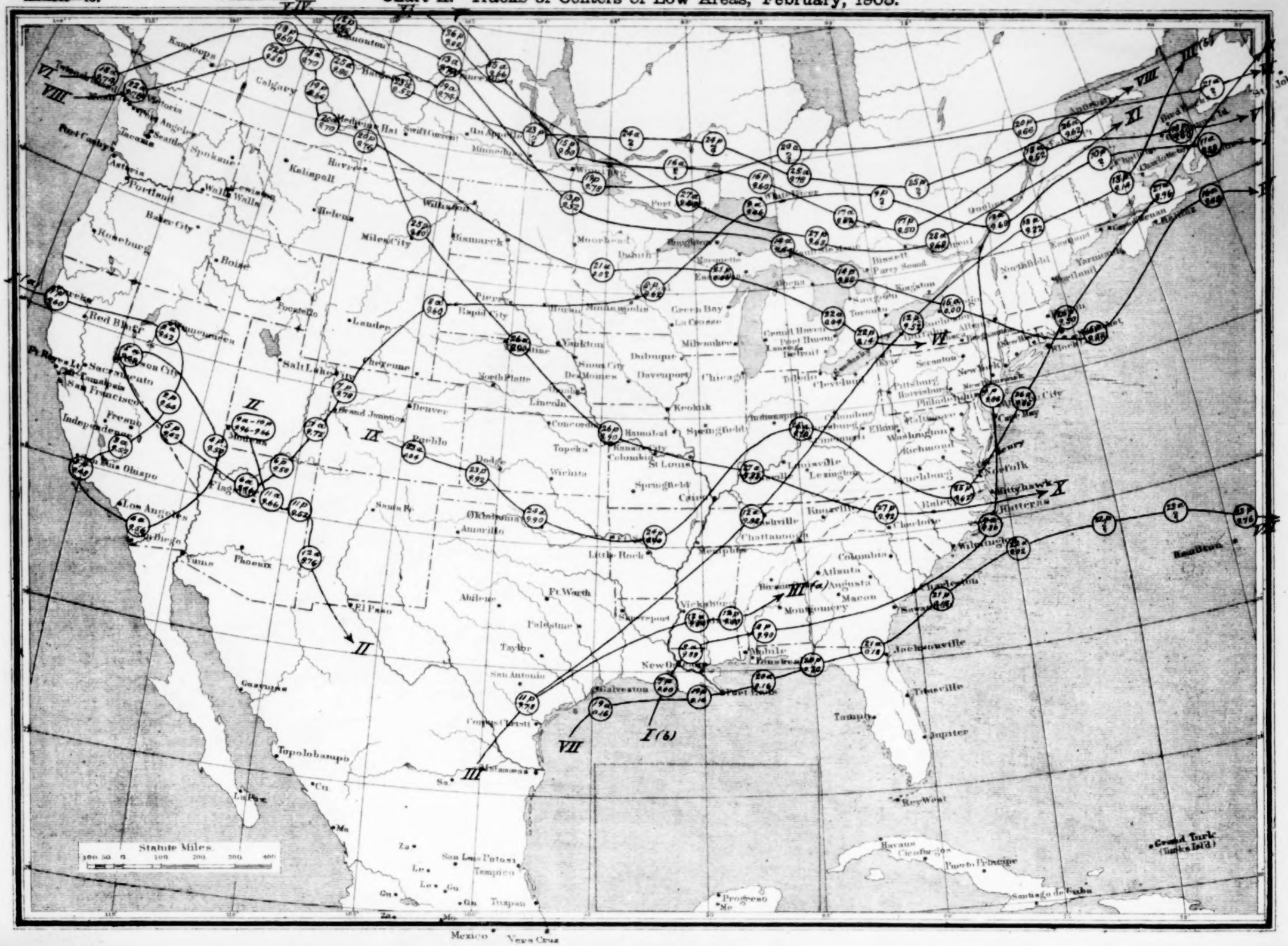
• Barkerville

Chart I. Tracks of Centers of High Areas, February, 1905.



• Barkerville

Chart II. Tracks of Centers of Low Areas, February, 1905.



Mexico Vera Cruz Bakersville

Chart III. Total Precipitation, February, 1905.

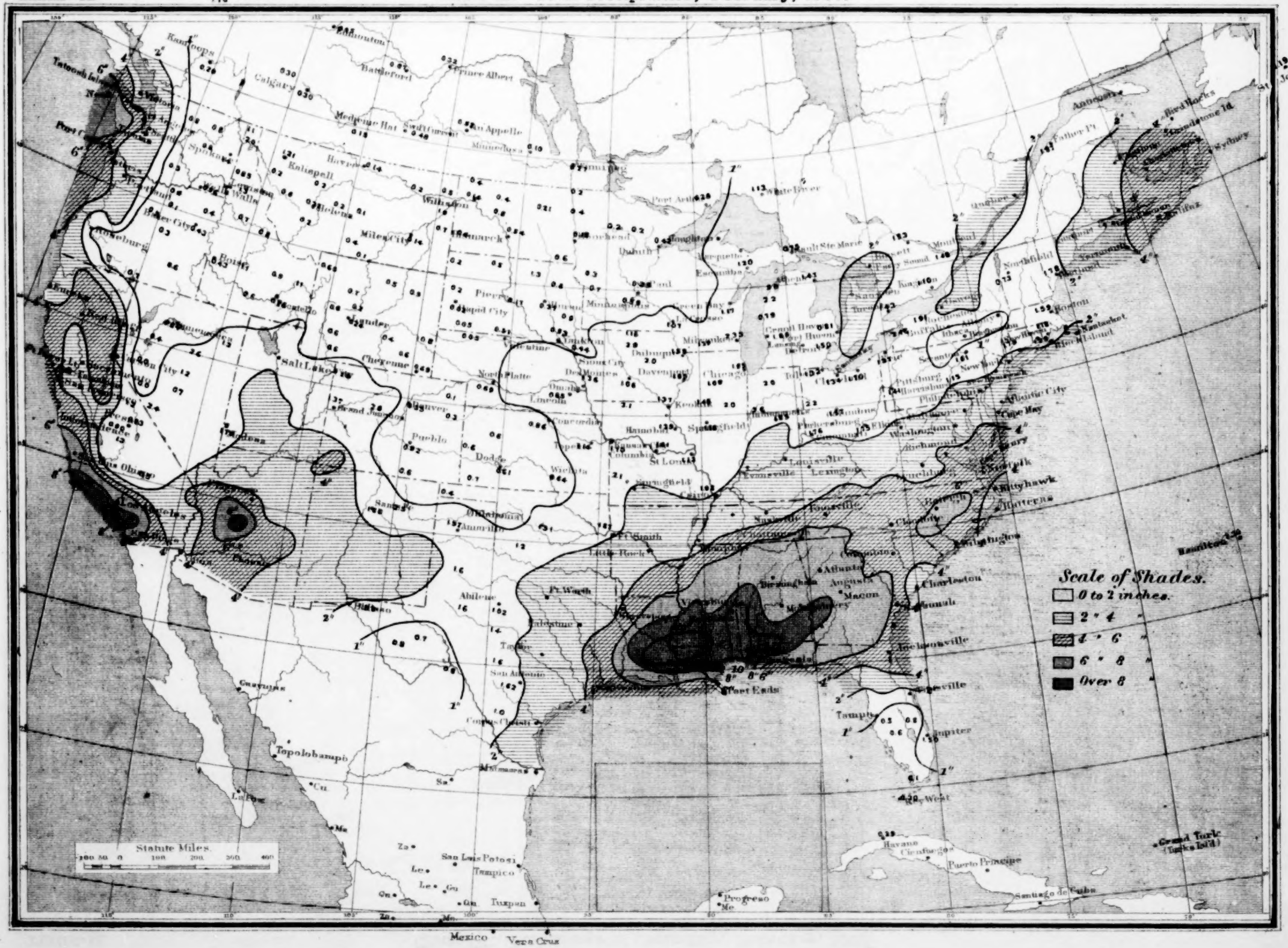


Chart IV. Percentage of Clear Sky, February, 1905.

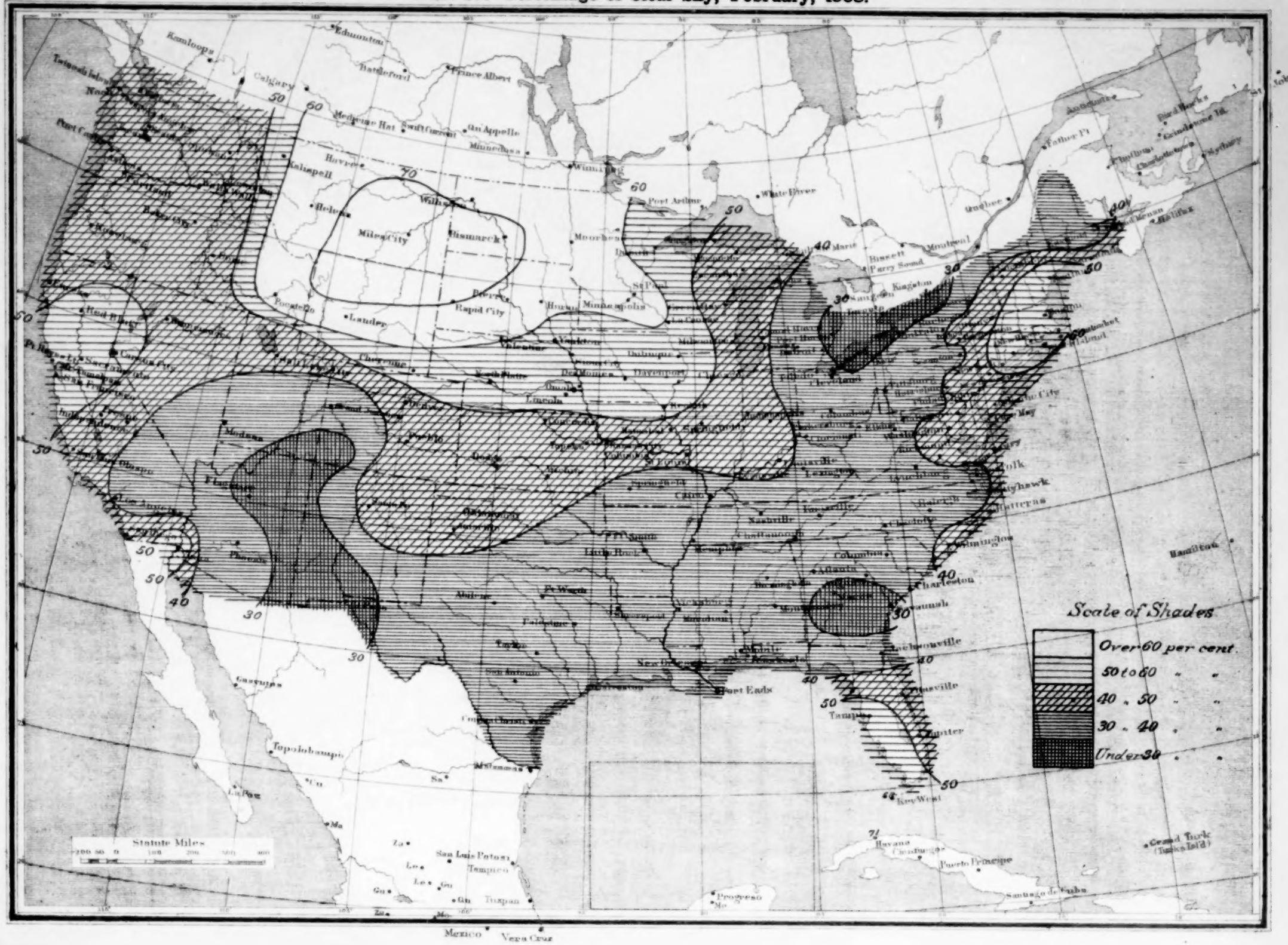
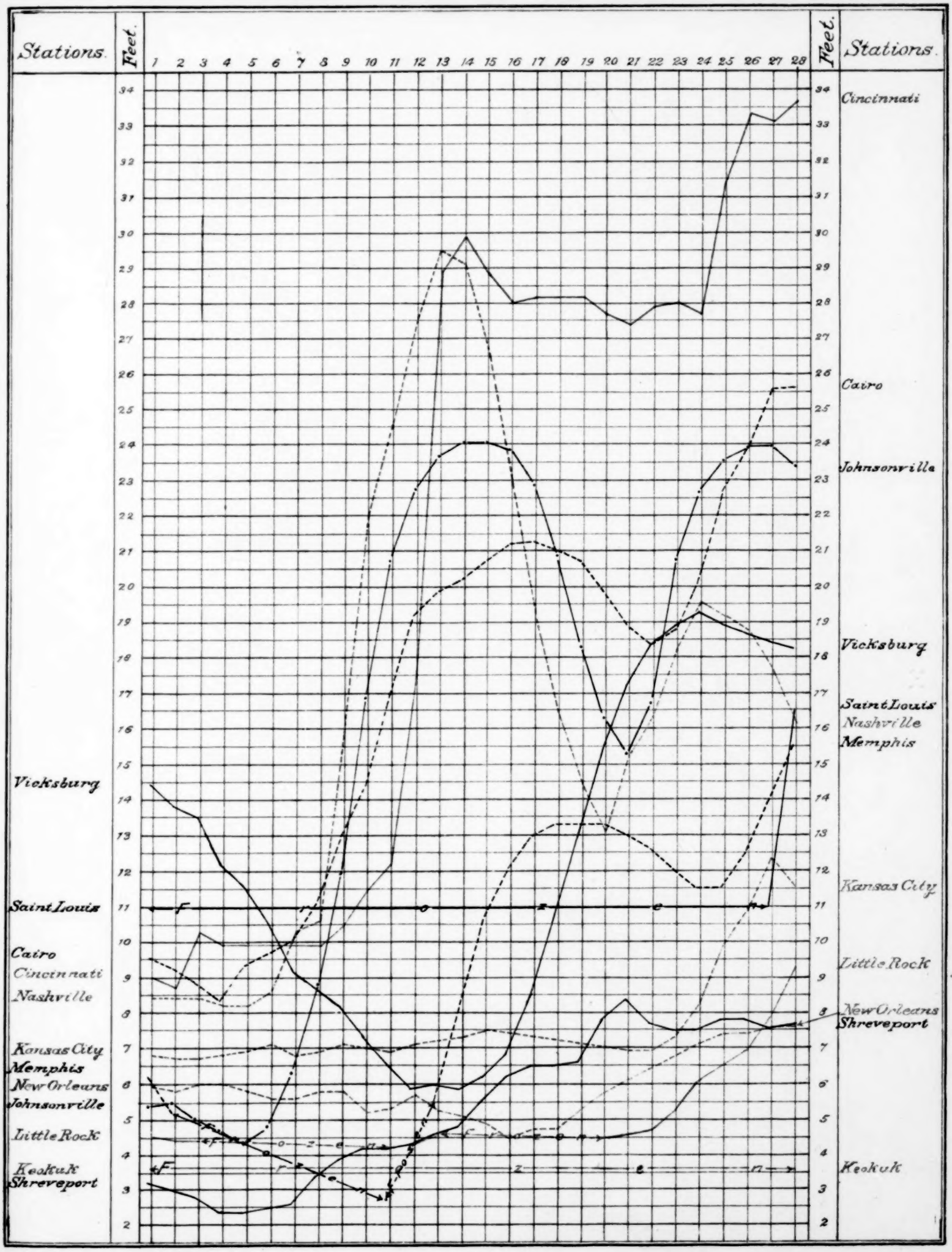
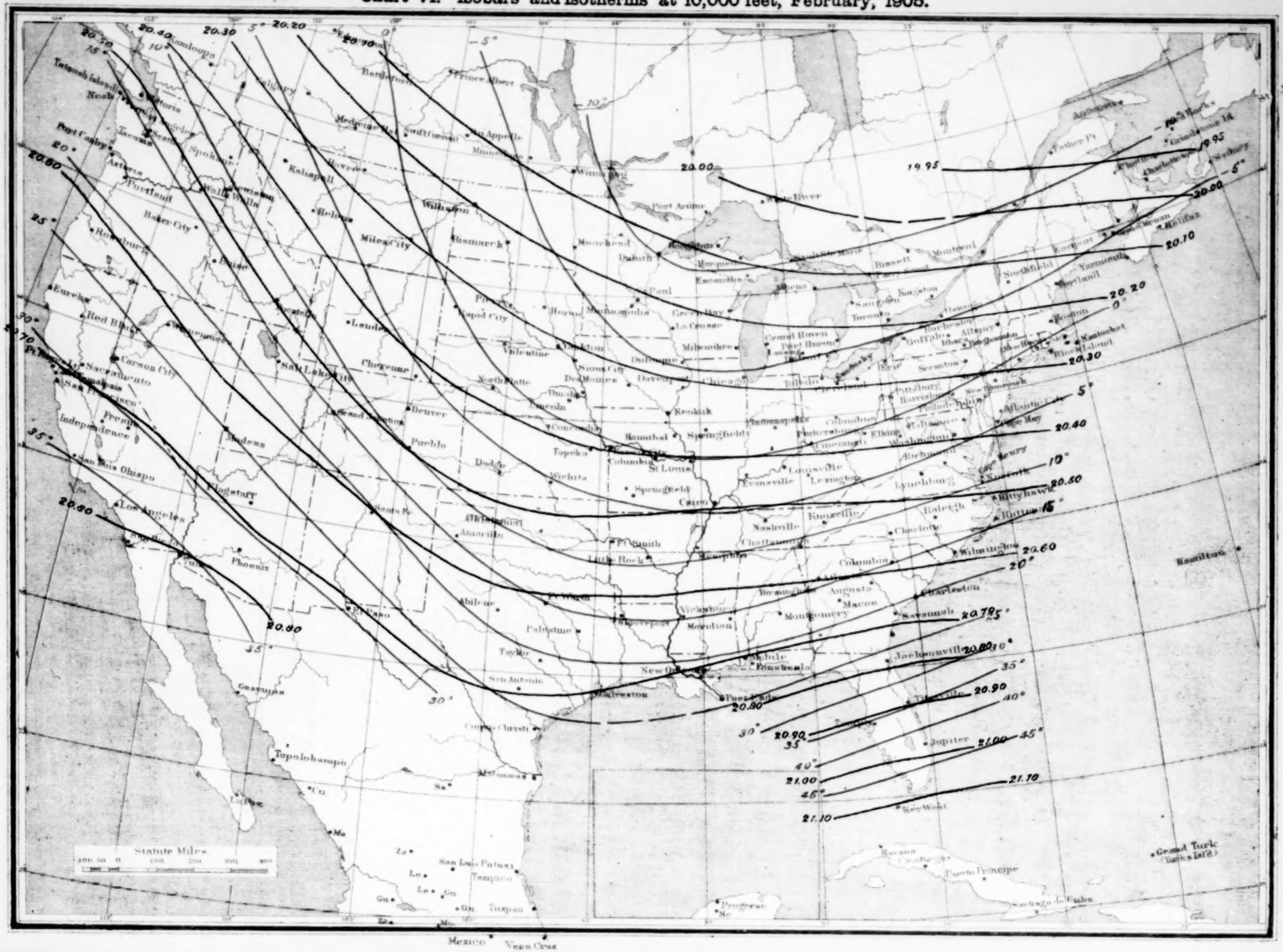


Chart V. Hydrographs for Seven Principal Rivers of the United States, February, 1905.



XXXIII—17. • Barkerville **Chart VI. Isobars and Isotherms at 10,000 feet, February, 1905.**



XXXIII—18. • Barkerville **Chart VII. Isobars and Isotherms at 3500 feet, February, 1905.**

• Barkerville

Chart VII. Isobars and Isotherms at 3500 feet, February, 1905.

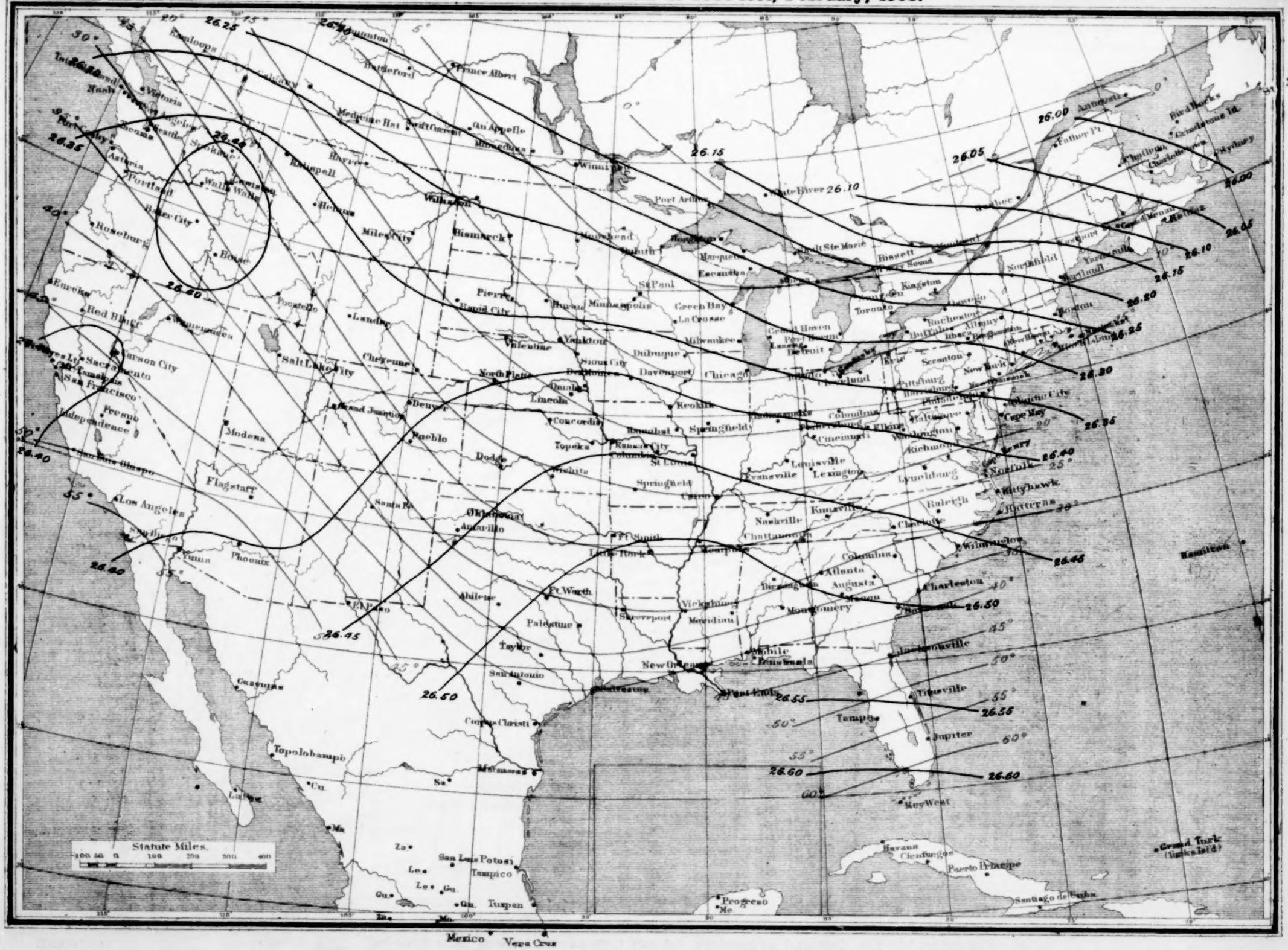


Chart VIII. Isobars and Isotherms at Sea Level; Resultant Surface Winds, February, 1905.

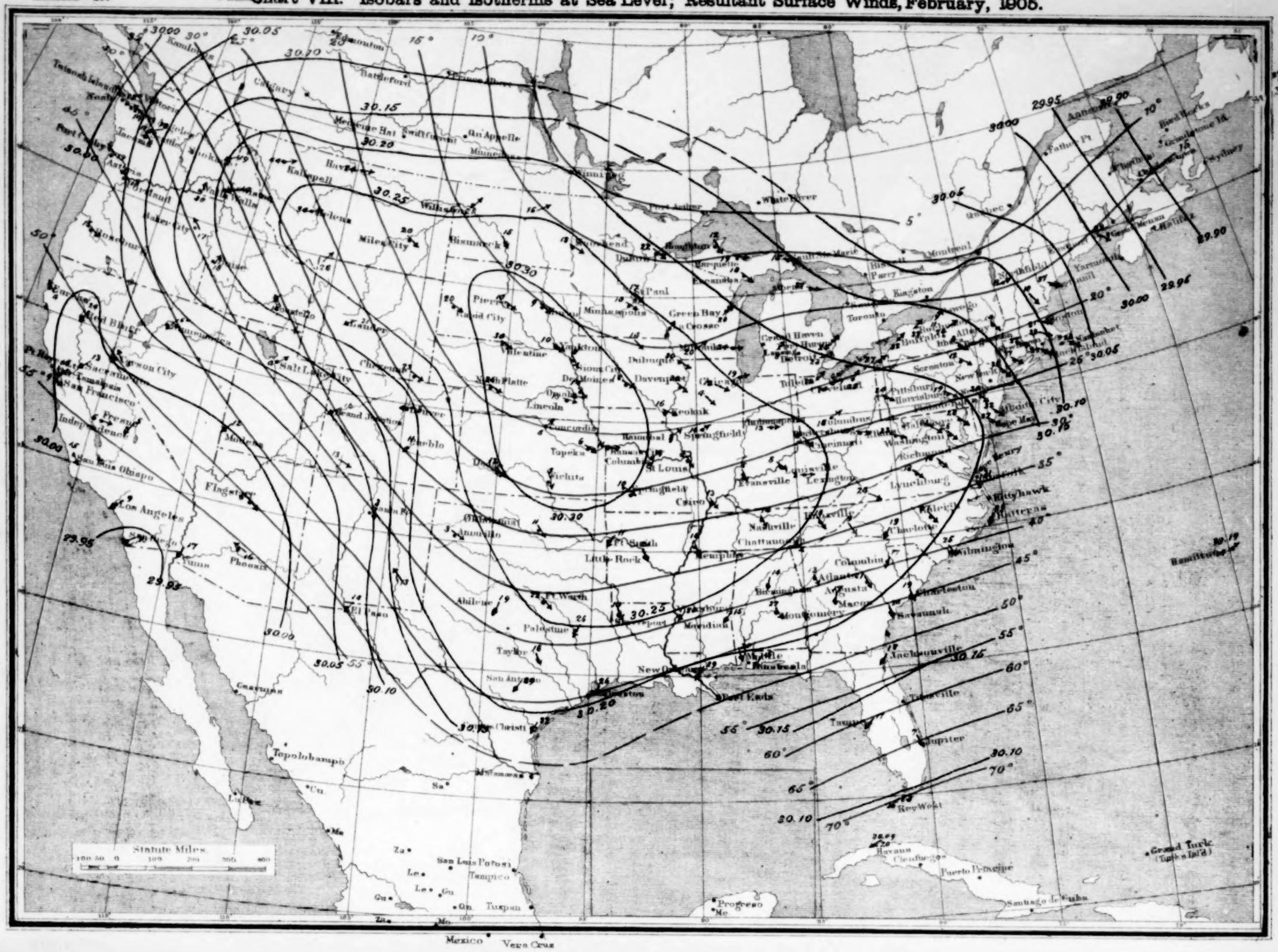
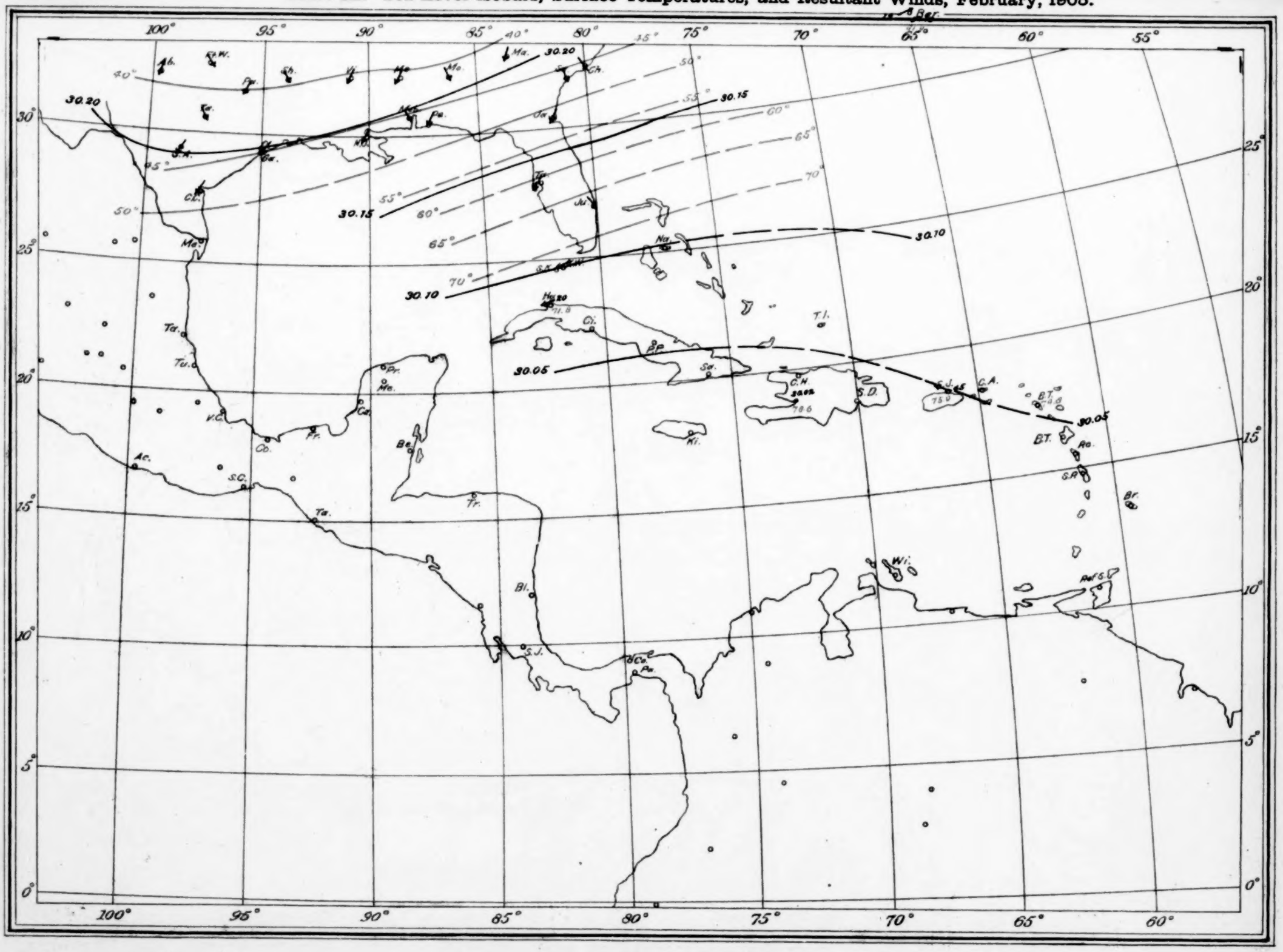


Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds, February, 1905.

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds, February, 1905.



XXXIII—21. • Bakersville

Chart X. Total Snowfall for February, 1905.

XXXIII—22. • Bakersville

Chart XI. Depth of Snow on Ground, February 28, 1905.

Chart XI. Depth of Snow on Ground, February 28, 1905.

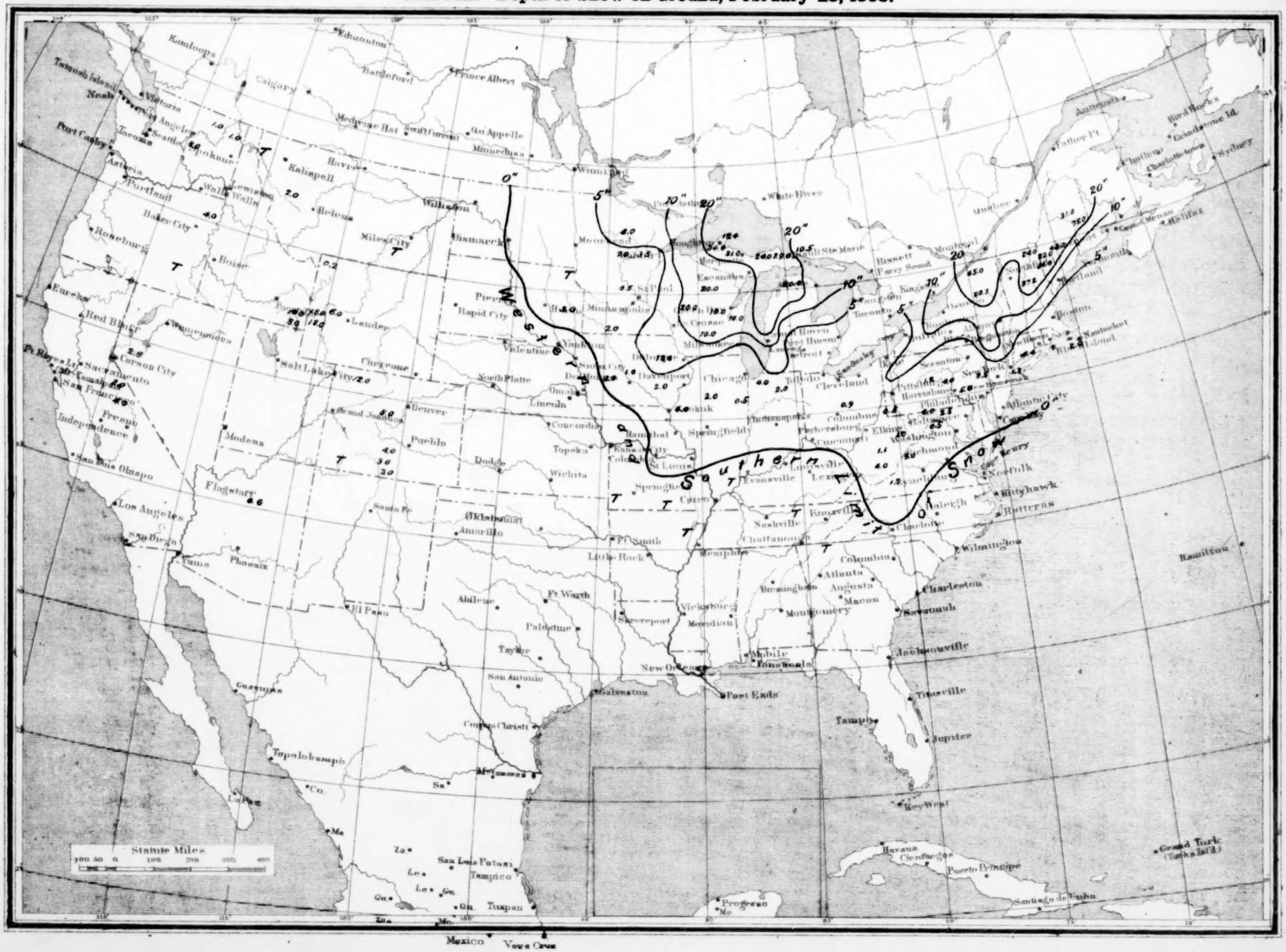


Chart XII. Temperature-Falls in the Lower Strata.

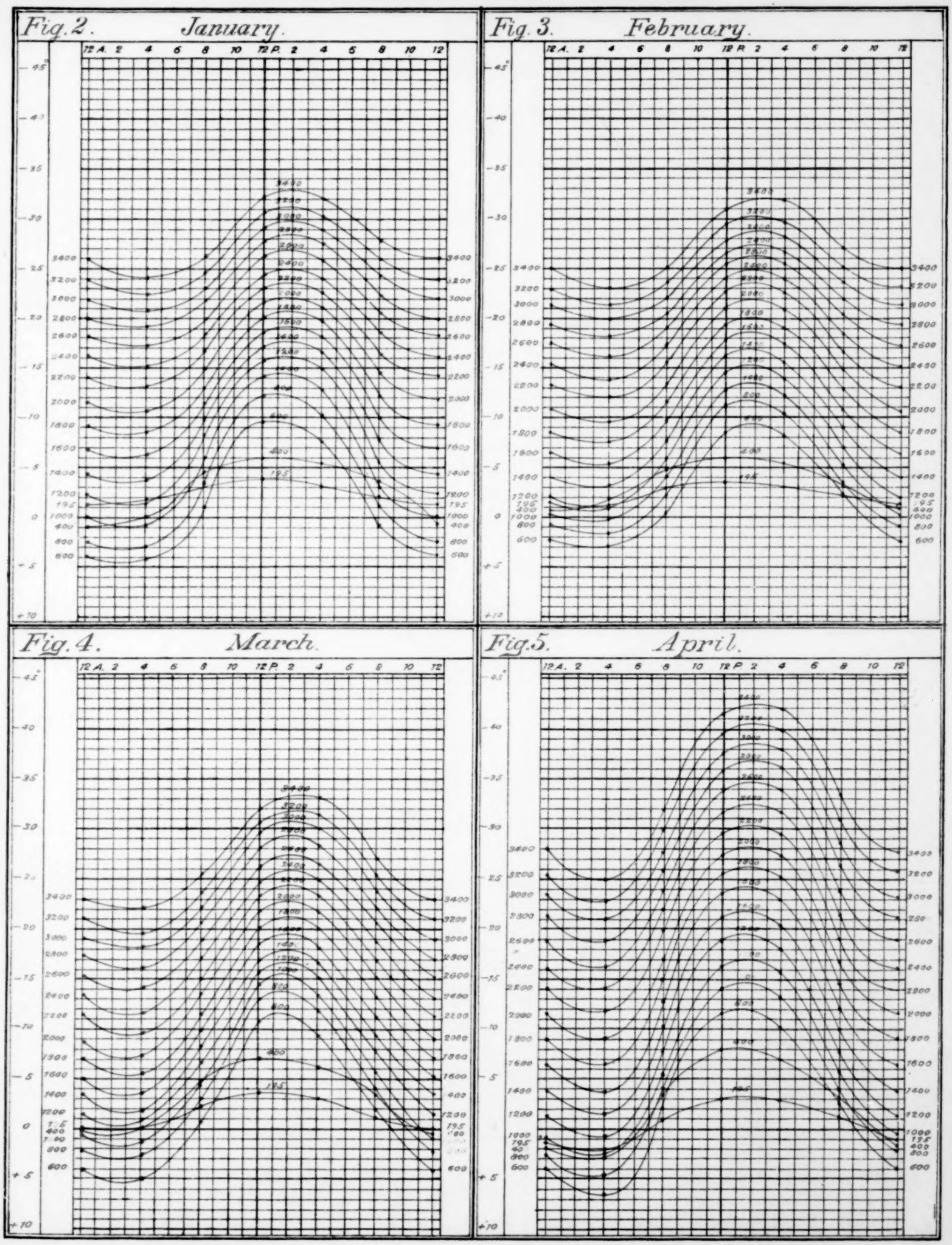
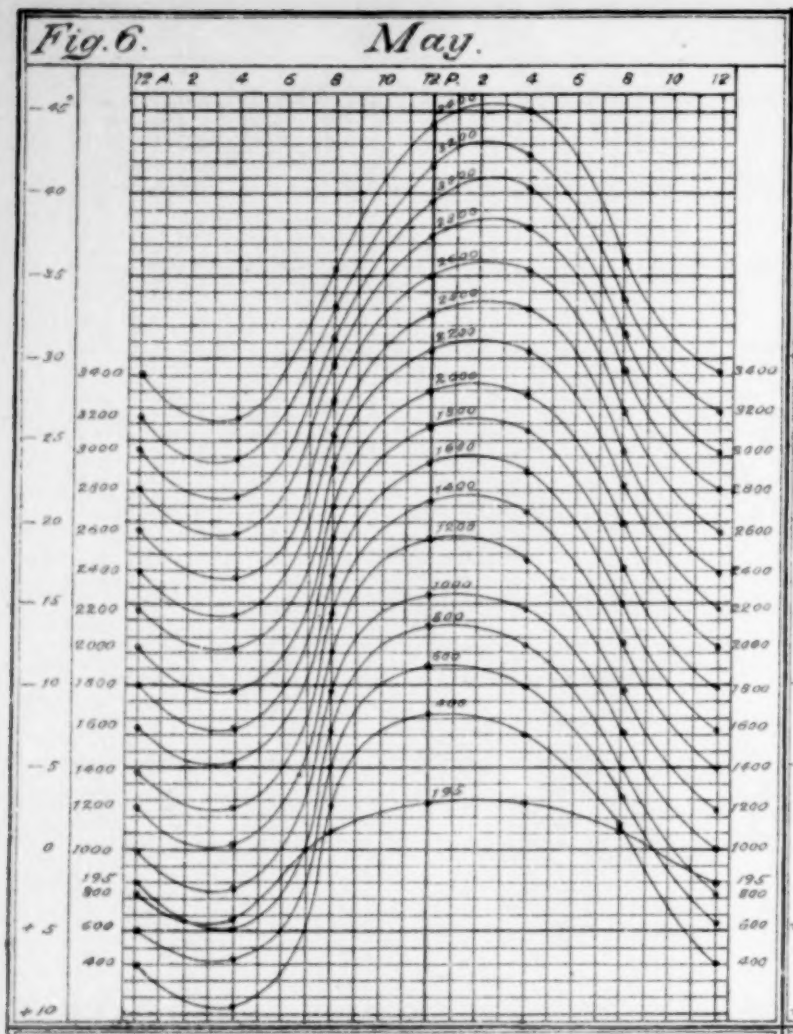
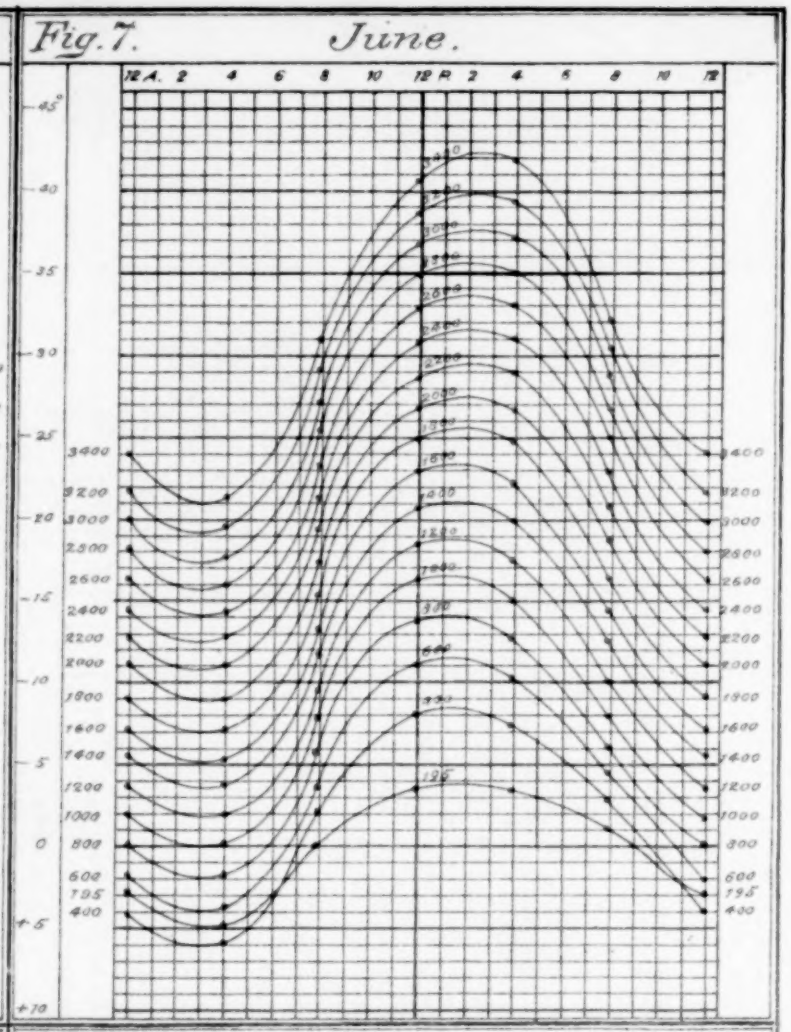
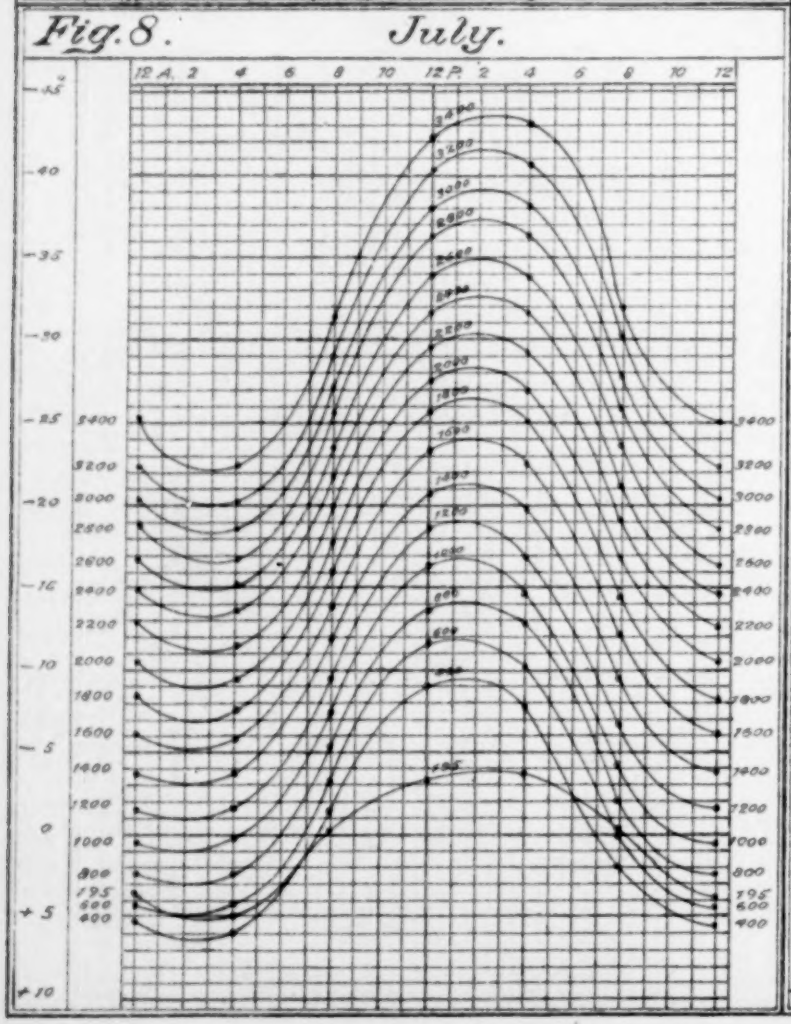


Chart XIII. Temperature-Falls in the Lower Strata.







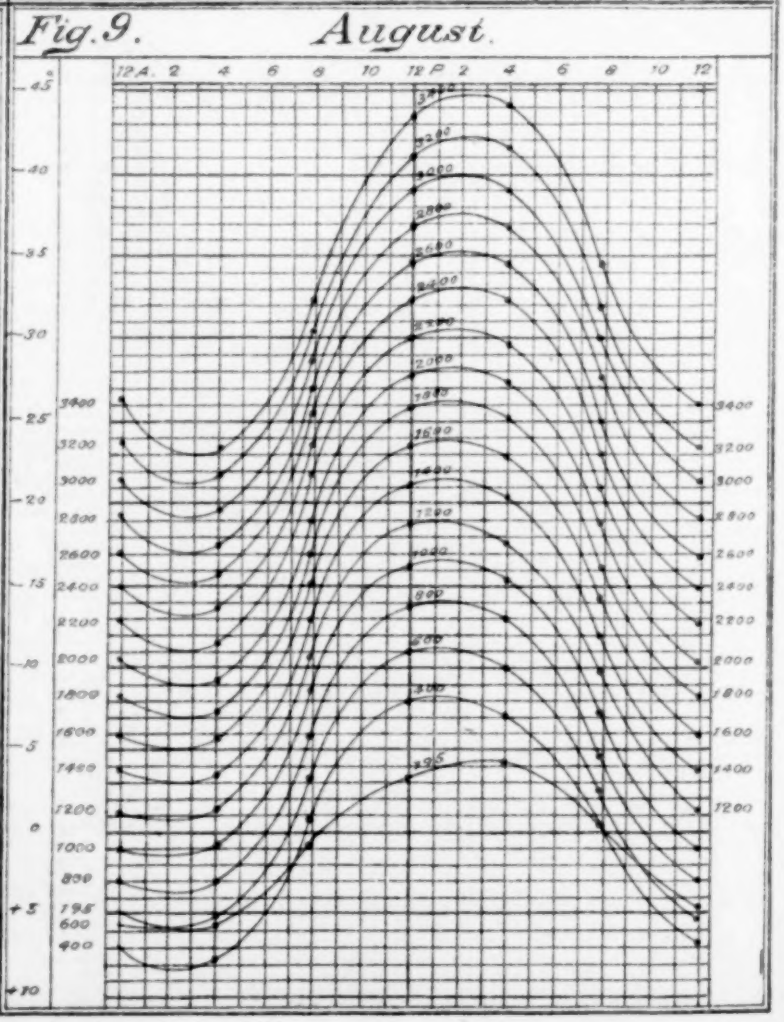
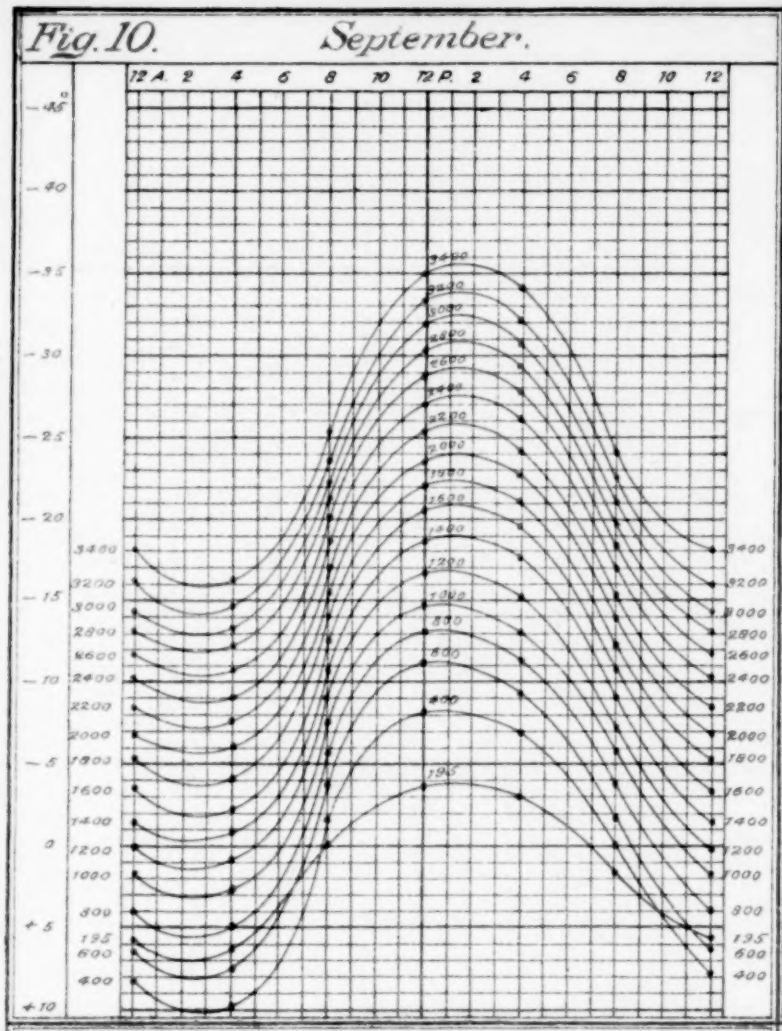
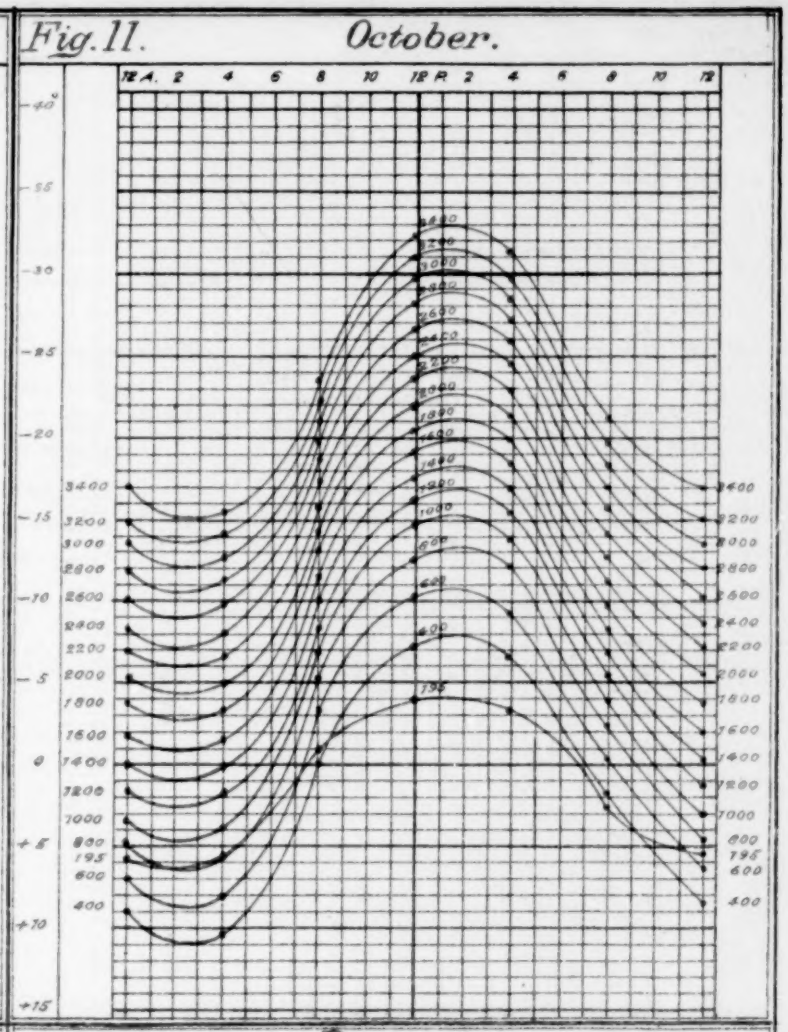
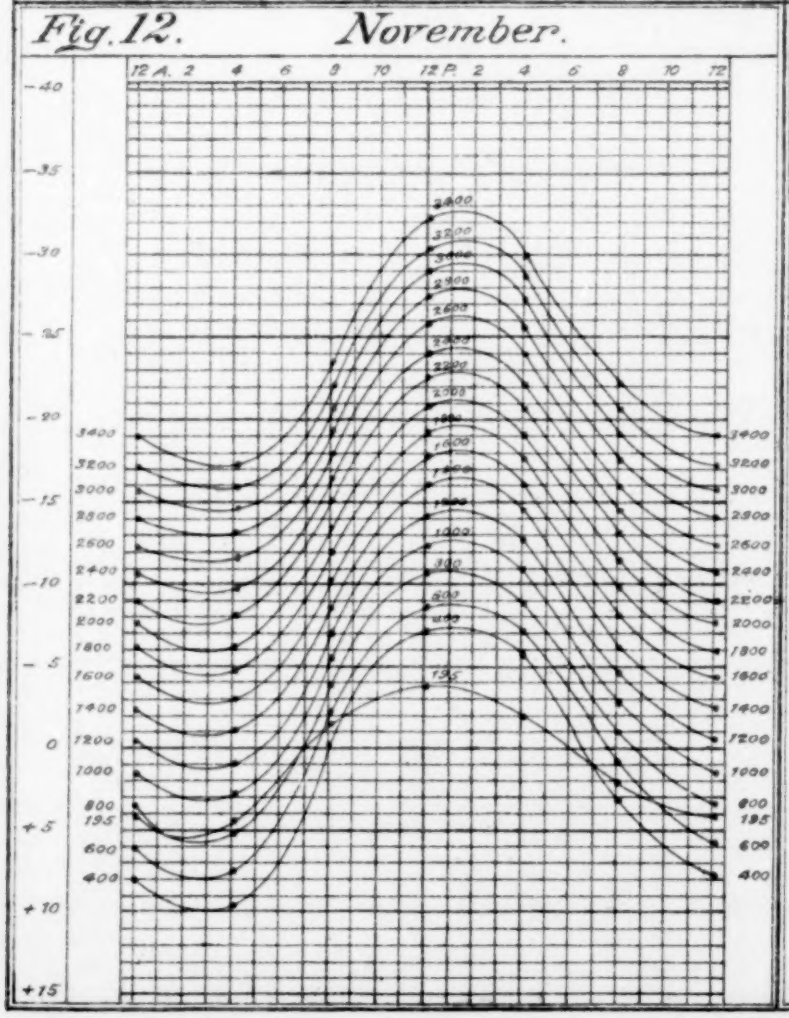


Chart XIV. Temperature-Falls in the Lower Strata.







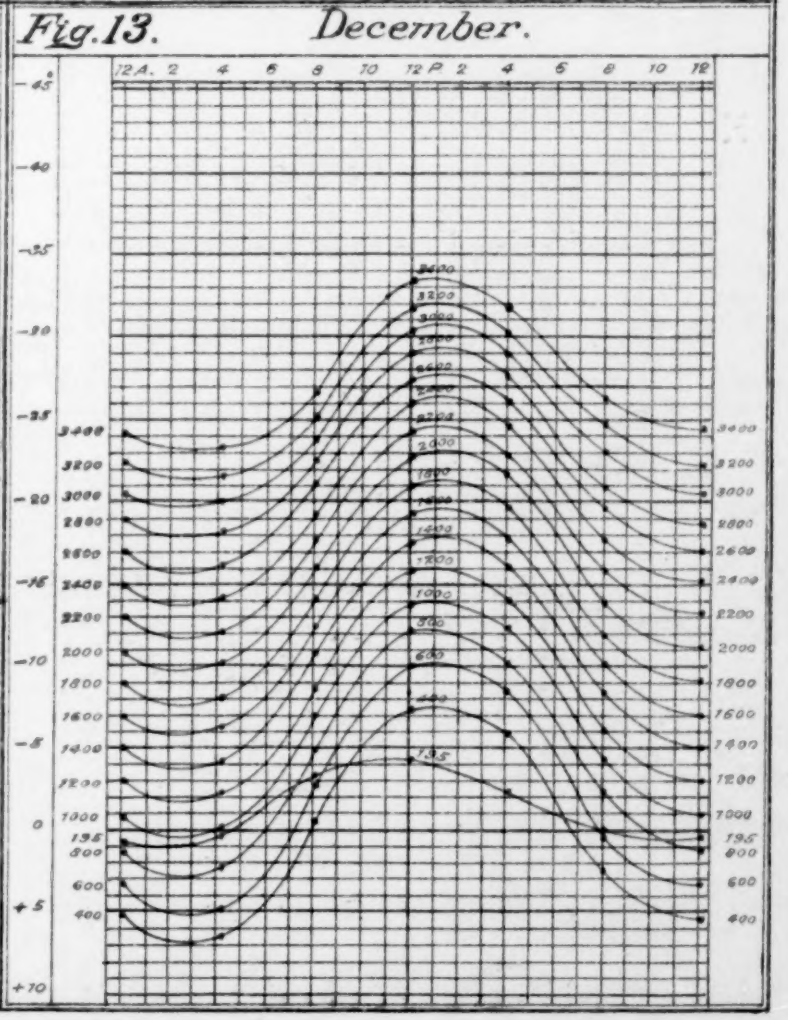


Chart XV. Blue Hill Temperatures in the Lower Strata.

Fig. 14. *January.*

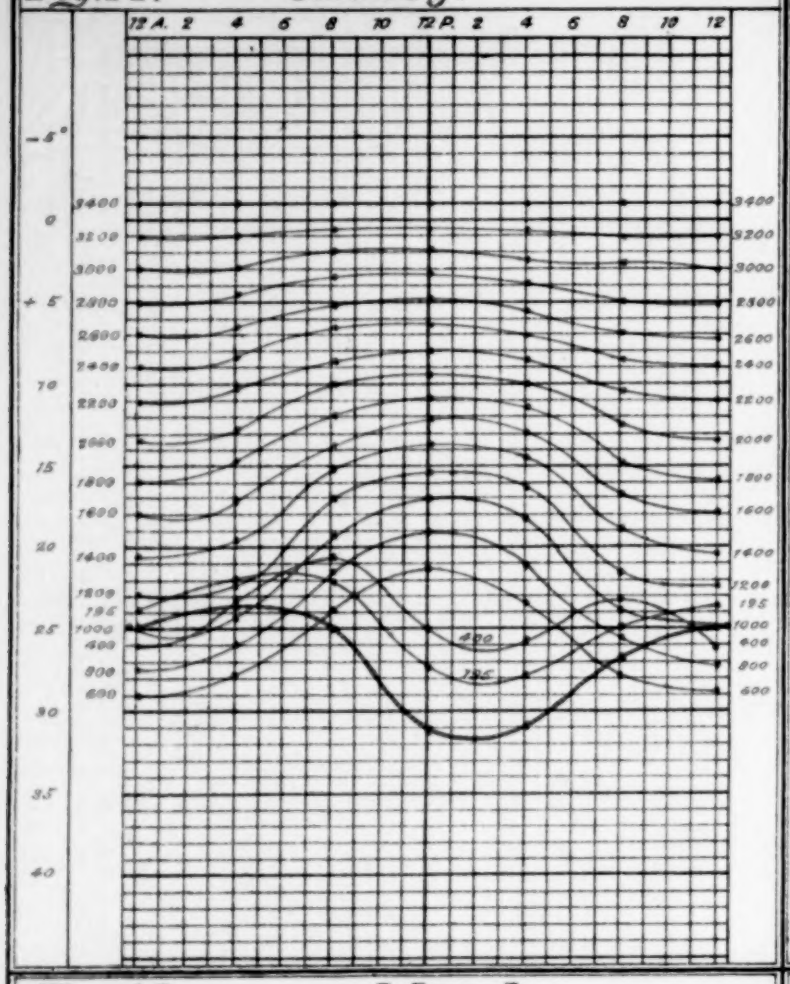


Fig. 15. *February.*

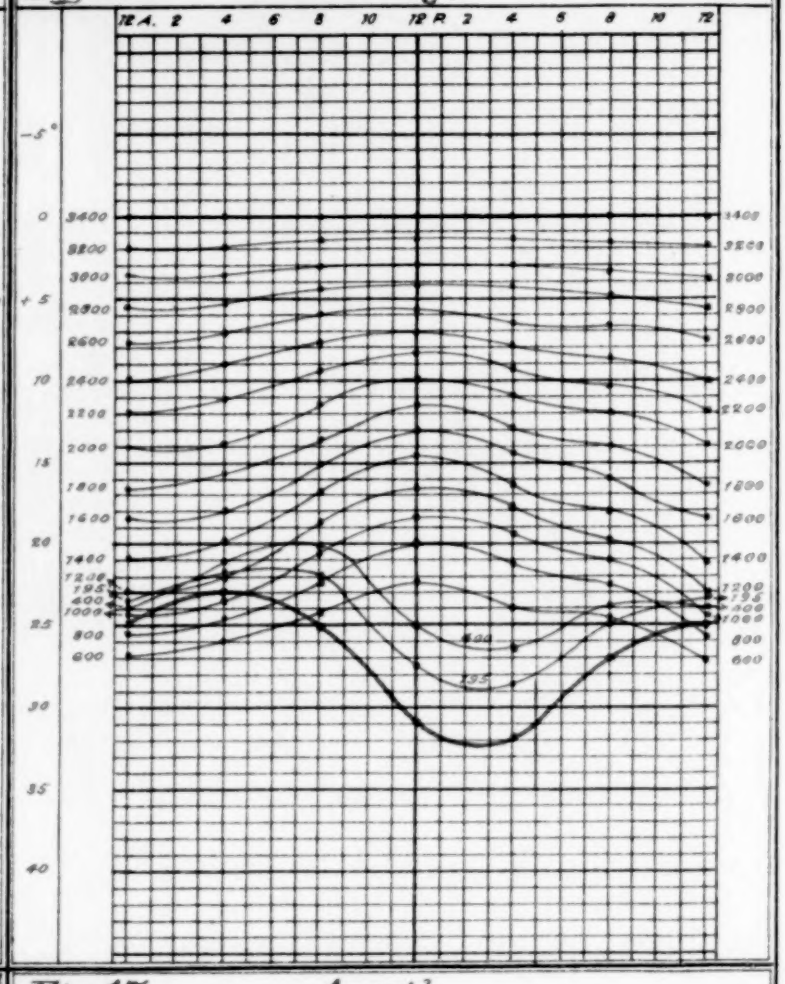


Fig. 16. *March.*

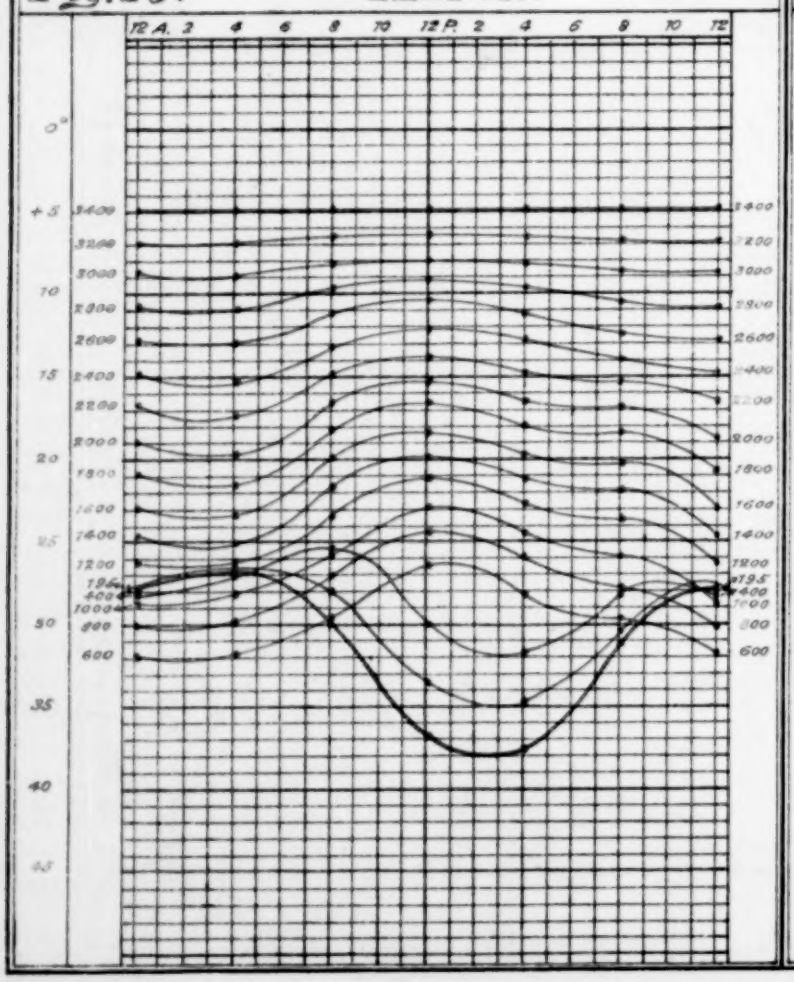


Fig. 17. *April.*

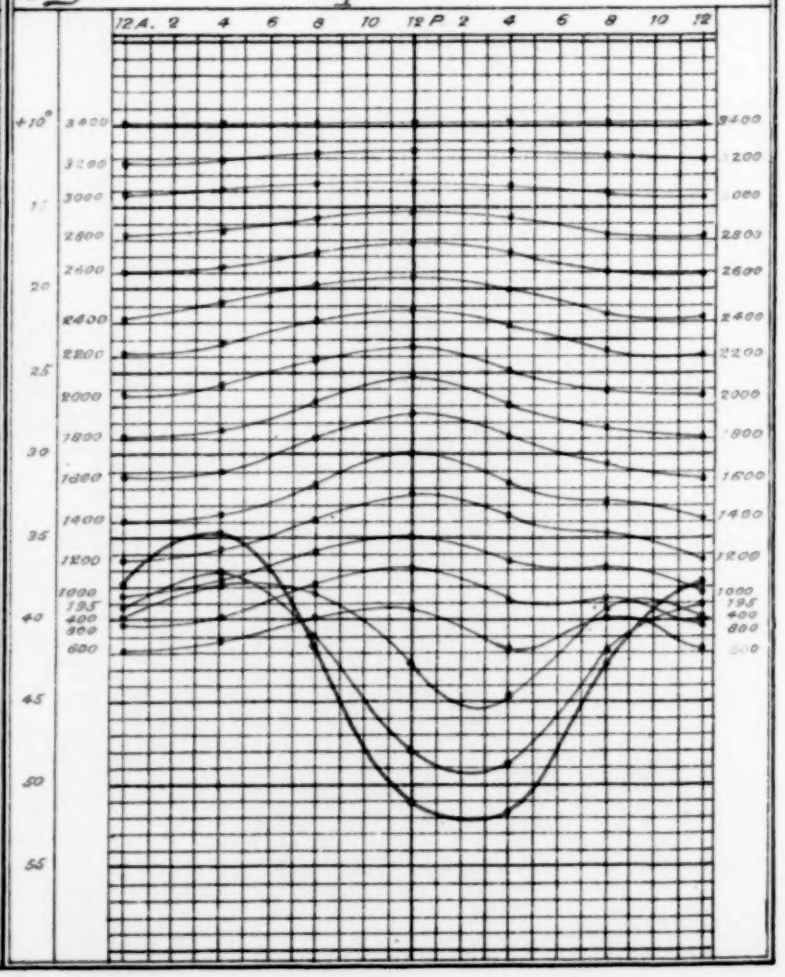
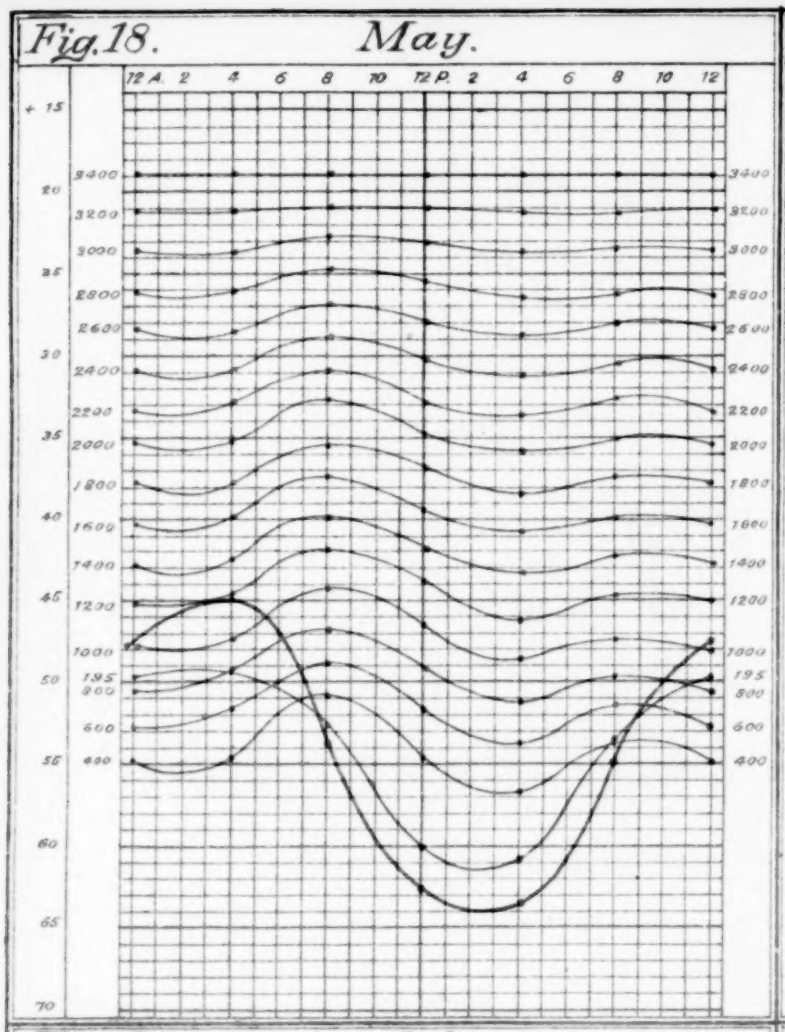
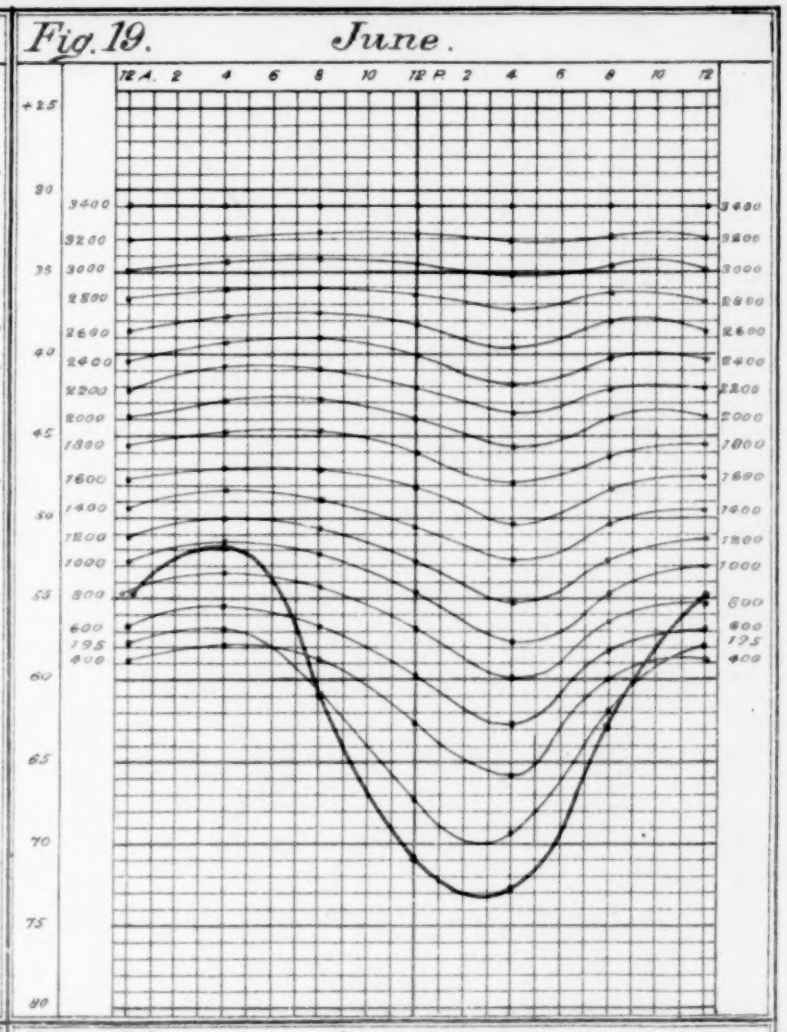
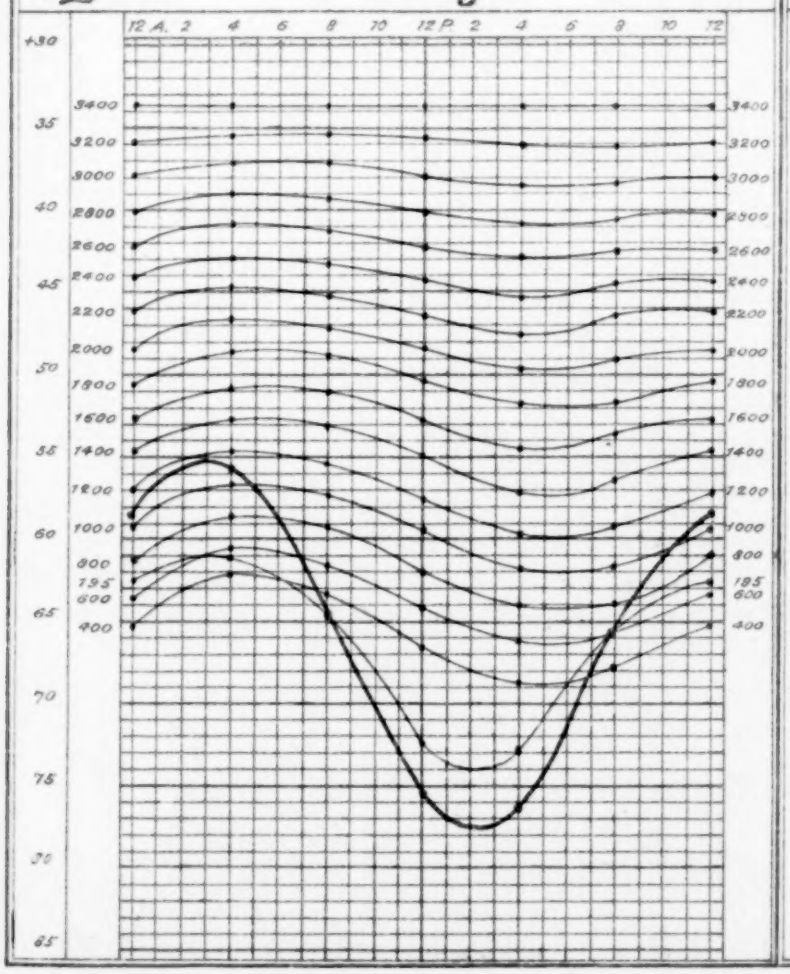


Chart XVI. Blue Hill Temperatures in the Lower Strata.







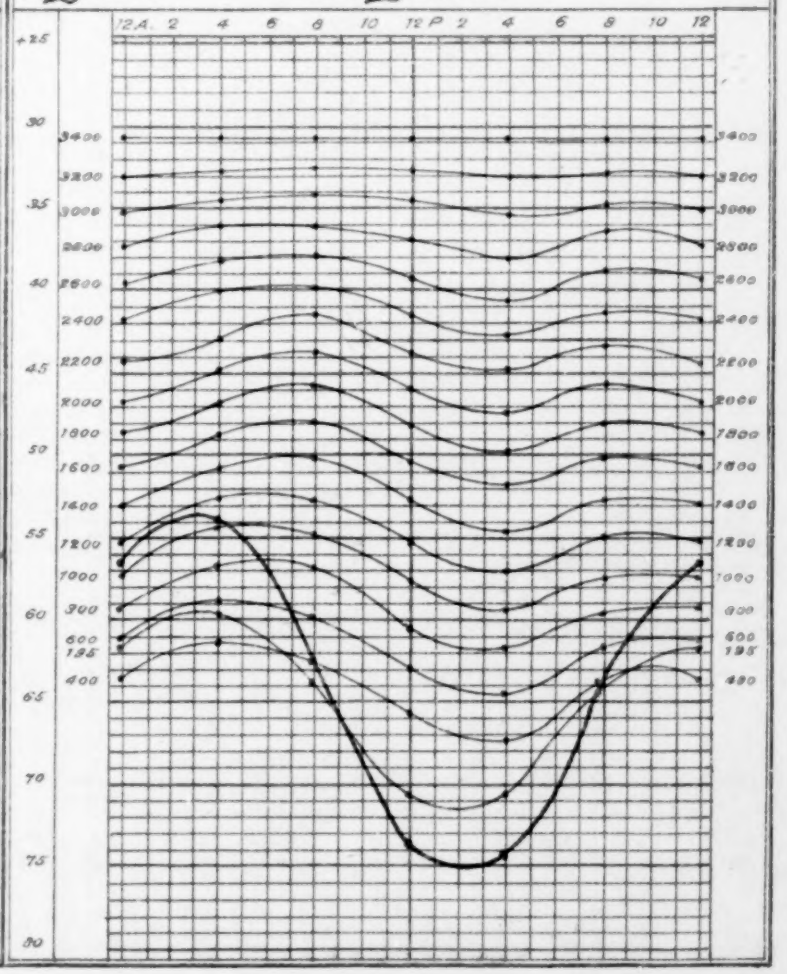
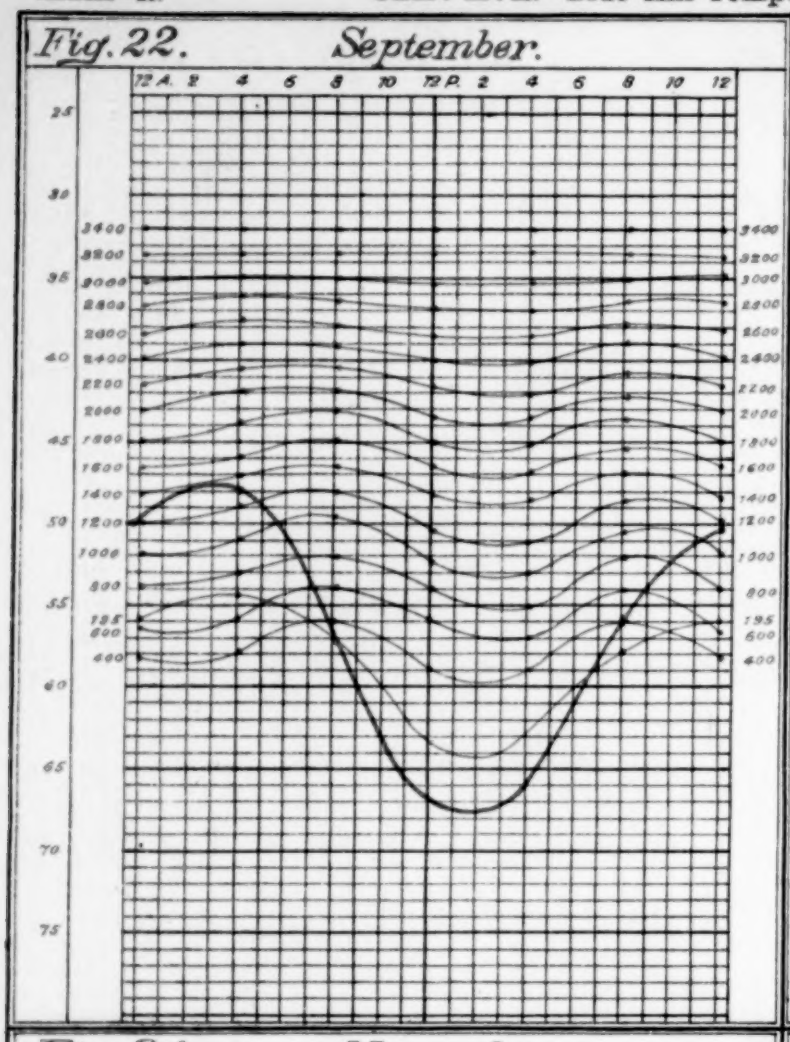
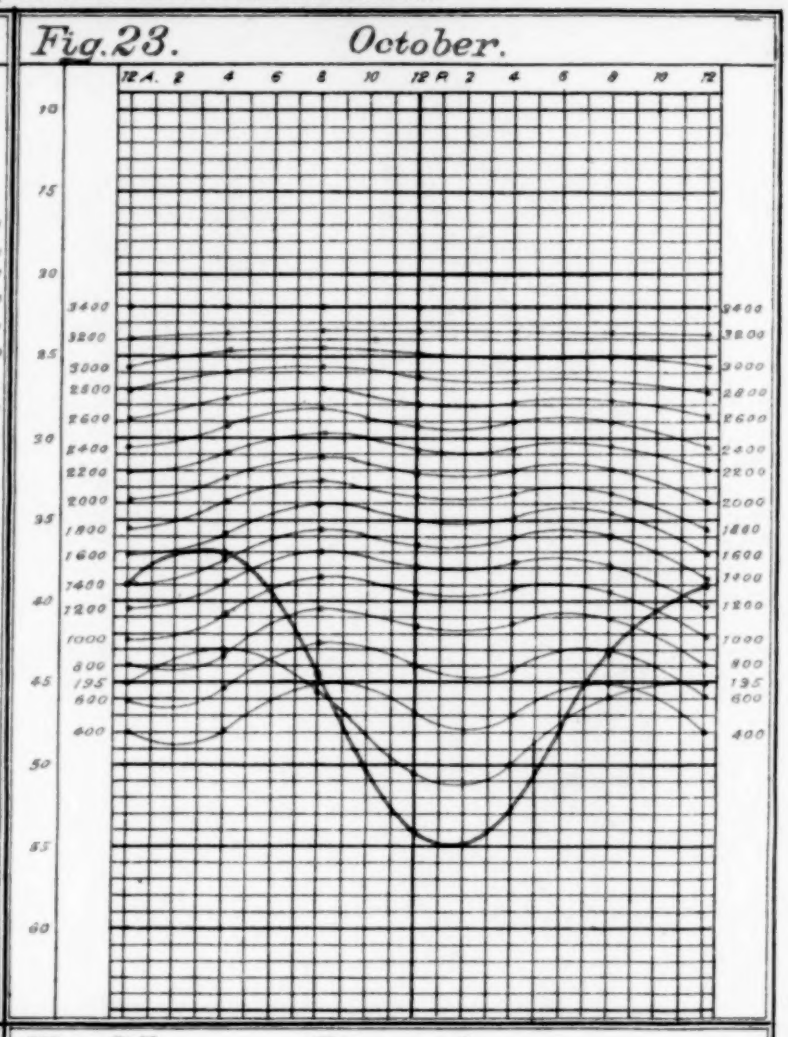
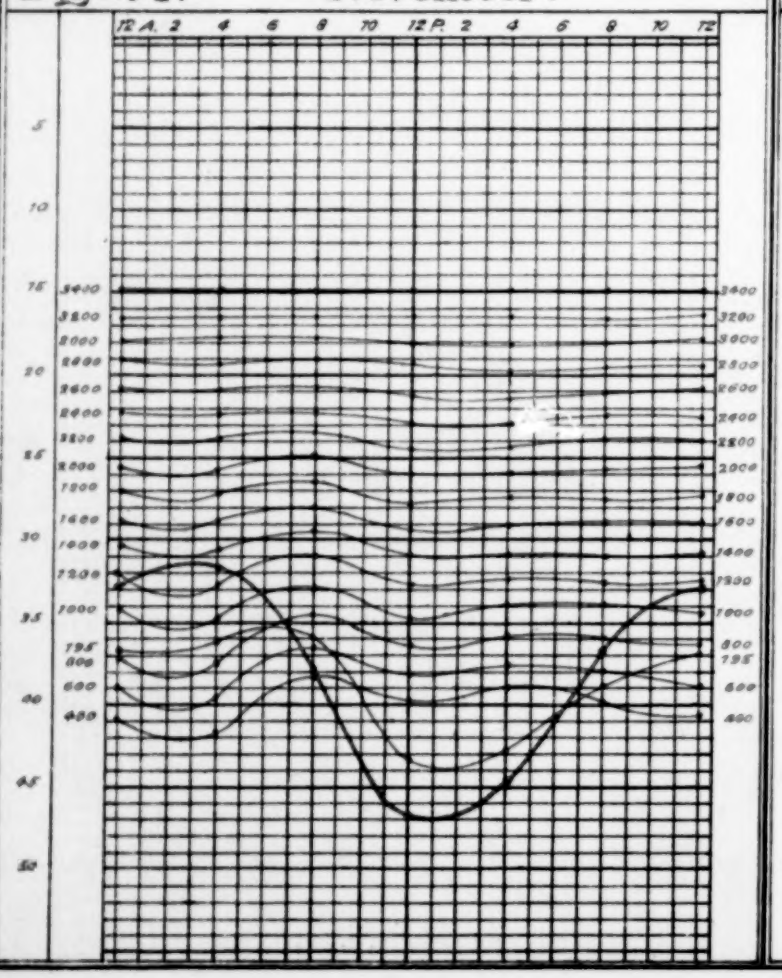
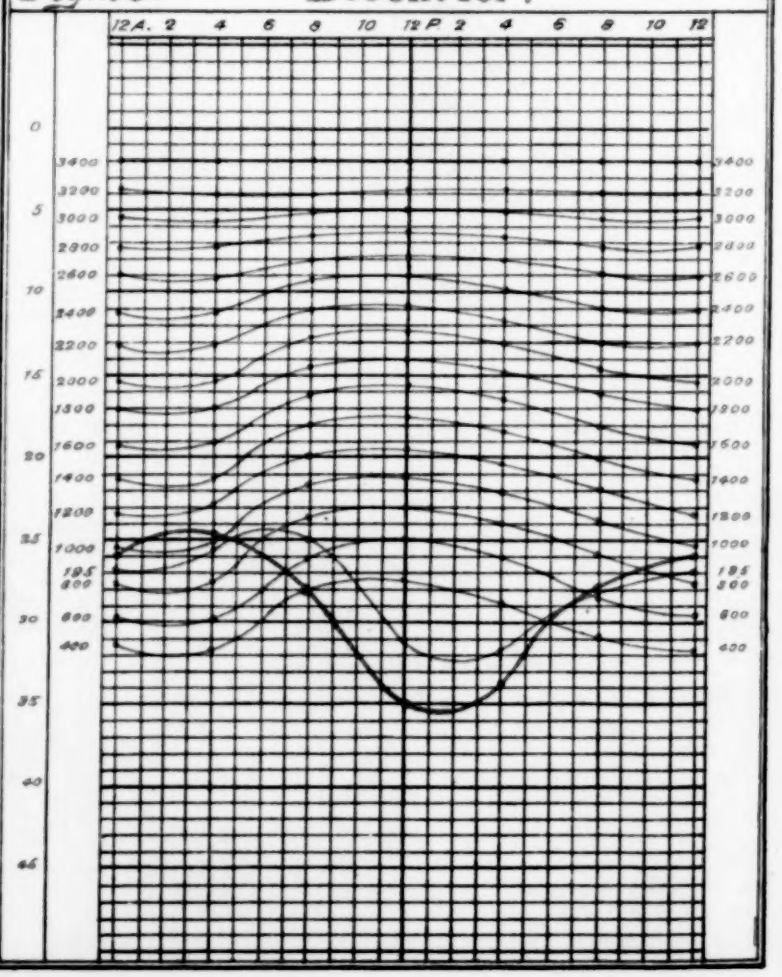



Chart XVII. Blue Hill Temperatures in the Lower Strata.